Co-op Mining Co.

Docket # 84-040
Cause # ACT/015/025

UMC 784.16 Coal Processing waste

(d) Applicant anticipates 0 % waste per ton of coal processed.

The coal we anticipate mining is very clean, containing less than 8% ash. This is marketable as it comes out of the mine, t here will be no washing or other waste extraction process before it is sold and removed from the site. There will be no waste site prepared as this would unnecessarily disturb more area.

The reference to mine waste rock in the Bear Canyon application was placed there by mistake, and should have referred to the Trail Canyon operation. In Trail Canyon, we have been reclaiming an area previously abandoned, and in that area only, have we encountered the need to remove rock. The Bear Canyon mine does not have an area like that to be reclaimed.

Coal storage areas are being constructed with a better slope for proper drainage of water, and better protected from any water entering the area from another source to minimize the chance of conditions that result in spontanious combustion. Stockpiles will be monitored daily to detect if any fire has started. Fires that have started can best be extinguished by removing the overheated coal from the stockpile and spreading it out to cool off.

UMC 784.19 Underground development waste

The above paragraph on coal processing waste applies to underground development waste, except that any refuse will be placed in dumpsters that will be serviced regularly by the dumpster owners, scrap metal will be placed in scrap cargo boxes placed at the site by scrap metal dealers, and waste oil and grease will be placed in drums to be picked up by licensed waste oil collectors.

UMC 784.20 Subsidence control plan

Existance of structures above the mine area:

"The area is composed of precipitous step-like terrain (cliffs alternating with steep slopes) which posed numerous sometimes insurmountable access problems ---" Chapter VI, Exibit VI a, page 2, Bear Canyon application. Any attempt to construct buildings in this area would have certainly posed numerous and insurmountable problems. Also see enclosed photograph.

Aquifers and recharge areas. See Chapter VII, Exibit VII-a page 1 through 8, Bear Canyon application. (Testimony of qualified Hydrologist that no aquifers or regharge areas exist in or above the mine area.

Grazing lands. See enclosed copy of U S Forest Service range classification of the land above the mine area. Most of the area is classified 7, -"Includes those areas with an inherent lack of forage and contributes little or nothing to the support of livestock or big game." N-4 is classified -"N- Unsuitable Range Not Used, 4-Sagesbrush or rabbitbrush."

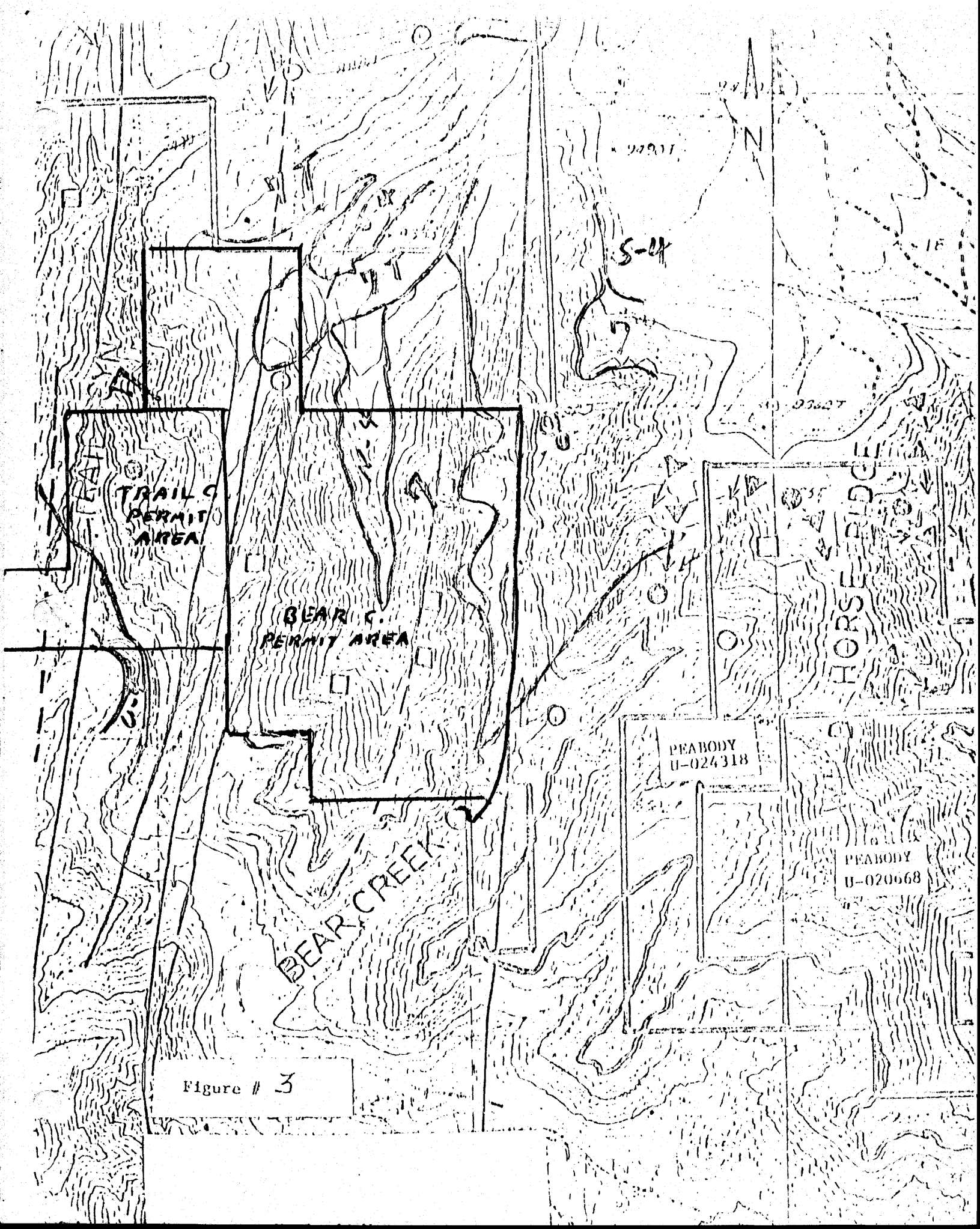
TRAIL C
PERMIT
AREA
BEAR C
PERMIT AREA
BEAR CREEK
PEABODY
U-024318
PEABODY
U-020668
S-4
N

Figure # 3

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3.5.8.1 Projected Impacts of Subsidence

The surface of the area to be mined that might be impacted by subsidence is used primarily for cattle grazing and wildlife habitat. No known aquifer exists above the immediate coal zone. Buildings, conveyors, etc. for the mining operation are all located East of the coal field. In general the area is rugged with limited access and not readily accessible to the public. Subsidence is not expected to be significant at the depths involved in the new areas.

3.5.8.2 Control Measures to Mitigate Impacts

The impact of the observed subsidence will be evaluated and used as a guide in determining the need for control of subsidence and for mitigation. The need for subsidence control and for a specific mitigating measure will need to be site specific. The surface water supply will need to be protected or mitigating measures utilized if adverse impacts occur.

Subsidence control can be accomplished by several methods as needed, such as:

1) Not pulling pillars in selected sensitive areas (i.e. near outcrops).

2) Uniform extraction to minimize impacts.

Mitigating measures are limited in this relatively inaccessible area. Damage to any surface structures including fences and roads can be repaired. The mitigation of flow reductions or drying up of a water source must be site specific Flow from springs can be diverted or conveyed over a crack that might disrupt flow. Water can be supplied to the area if a critical need exists.

3.5.8.3 Subsidence Monitoring

A base map has been prepared showing contours and surface features that might be impacted by subsidence, such as surface structures and springs (Plate 3-3). The extent of

Fig. 1

Fig. 2

mining is shown on Plate 3-4 and the area where pillars will be removed is indicated.

This base map will be updated annually. Co-Op will notify adjacent property owners concerning subsidence potential prior to approaching their boudaries. Co-Op will conduct an annual survey to identify all evidence of subsidenc As annual field survey will be made to identify observable subsidence.

When subsidence is observed to adversely impact a surface structure or resource, the extent of the impact will be evaluated.

As pillars are pulled under the western portion of the mine plan area, impacts will be anticipated and hazards assessed on a site-specific basis. An overburden of approximately 1,000 feet or more in the western portion of the mine plan area should minimize surface impacts. Sandstone formations overlaying the Blackhawk coal bed should better distribute stresses and reduce the tendency for surface cracks and subsidence at the surface.

3.5.9 Waste Disposal Plans (Spoils, Coal Processing Wastes, Mine Development Wastes, Non-Coal Wastes, Removal, Handling and Storage

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H/C
4-27-84

SECTION 7

HYDROLOGY

SCOPE AND INVESTIGATIONS

The purpose of this section is to provide background information on the hydrogeology characteristics of the Co-Op Mining Company's Bear Canyon Mine permit area and the surrounding regional area. Also to present a plan of action for complying with the requirements of the Office of Surface Mining (OSM) and the Utah Division of Oil, Gas and Mining (DOGM). In particular, this section includes an evaluation of the geological and hydrological setting of the mine, its relation to the regional ground water and surface water hydrology and its probable impact on the groundwater and surface water systems.

Information gained from field reconnaissance and a review of data from various sources was used in compiling this section. The data sources included information from the Co-Op Mining Company, reports by the U. S. Geological Survey, Utah Geological and Mineral Survey, U. S. Forest Service and mine application permits on file with OSM (specifically those in the Huntington Canyon area).

7.1 GROUNDWATER HYDROLOGY

7.1.1 REGIONAL AREA

The Bear Canyon Mine is part of the Wasatch Plateau coal field which in turn is part of the High Plateaus area of the Upper Colorado River Region. Available data on groundwater resources for this area is rather scarce. Most of the water supply development has been limited almost entirely to surface water. In general, what records are available are the result of information gathering on specific problems, mostly gas and oil wells, rather than as part of a continuous data-gathering program. Previous experiences at local area mines are the best data sources.

The Wasatch Plateau has been characterized as a groundwater recharge area. The high elevations with the resulting large snowfalls combine with the generally flat profile of the plateau in enhancing infiltration of water. Despite this, practically all precipitation is consumed at or near the place of fall by sublimation and evapo-transpiration or becomes overland run-off. The water that does infiltrate into the ground generally discharges within a short distance as springs or seeps. Only about 4 percent of precipitation is estimated to become groundwater recharge (Price and Arhow,'74).

The groundwater yield from the Wasatch Plateau strata is usually very low. For the most part, the strata consist of consolidated and semi-consolidated sedimentary rock which have low hydraulic conductivities and specific yields between .2 and 2.0 percent. Yields to individual wells are generally less than 50 gpm. Higher yields might be available

from the Star Point Sandstone stratum or from local perched water zones. Ordinarily, however, perched water bodies could not sustain large perennial yields (Price and Waddell,'73).

7.1.2 MINE PLAN AND ADJACENT AREAS

Groundwater for the area seems to be derived from snowmelt. The recharge occurs on the plateau top with the snowmelt infiltrating the strata through faults and rock fractures. In order to determine the source of recharge; samples of water from rain, snow, springs, seeps and mines were analyzed for concentrations of deuterium. The results of the analyses showed that deuterium concentrations were similar in snow, spring and mine water but were different in rain water (snow and spring values: -120 to -154, rain values: -54 to -85; Danielson,'81). See Table 7-1.

Recharge for the Bear Canyon area comes from water percolation and infiltration on Gentry Mountain and Ridge. The downward vertical movement of water is commonly impeded by low permeability beds of shale and mudstone in the North Horn, Price River, and Blackhawk Formations. Much of the recharge from snowmelt in the higher parts of the region is discharged by a large number of springs close to the original recharge areas. The water is discharged by springs and seeps where the low permeability rocks outcrop at the land surface, particularly along the sides of the many deep canyons' walls.

Groundwater generally moves from areas of recharge in the higher parts of the region in a southerly direction to areas of discharges.

TABLE 7-1

--Concentrations of deuterium in rain, snow, spring waters, and waters in mines
[Analyses by Centre D'Etudes Nucleaires de Saclay, France]

Location: See explanation of data-site-numbering system in text, plate 1, and figure 16.
Source: 1, rain; 2, snow; 3, spring water; 4, Wilberg Mine water; 5, Deer Creek Mine water.
Date: As shown except for source 1, accumulated rain June-October 1978; source 2, core of accumulated snow October 1978-May 1979.
Altitude: In feet above National Geodetic Vertical Datum of 1929.
Value: Value = $\frac{(D/H)\text{ sample} - (D/H)\text{ SMOW}}{(D/H)\text{ SMOW}} \times 1{,}000$;

where

H = hydrogen content,
D = deuterium content, and
SMOW = Standard Mean Ocean Water (Craig, 1961).

Location	Source	Date	Altitude	Value	Location	Source	Date	Altitude	Value
(D-14-6)7cbb	2	--	8,520	-147.1	(D-16-7)35abc-S1	3	8- 9-79	6,620	-123.2
13cdb	2	--	8,520	-147.1	(D-16-8)5bac-S1	3	5-16-79	8,400	-120.8
14daa	1	--	8,350	-84.5	(D-17-6)11cdc	2	--	8,100	-141.7
21dca	2	--	9,020	-121.2	23aaa-S1	3	8- 9-79	7,766	-127.6
28abc	1	--	8,860	-84.3	25bdd	1	--	7,280	-54.4
(D-15-6)13dad-S1	3	8-23-79	8,320	-129.9	(D-17-7)5cad-S1	3	5-16-79	9,320	-153.7
(D-15-7)5dbb	2	--	8,020	-140.3	10cbd	5	8- 2-79	--	-125.8
29dca	2	--	7,520	-125.5	10ccb	5	8- 2-79	--	-122.5
34cdd-S1	3	8-22-79	8,000	-125.9	16aad	5	8- 2-79	--	
34dac	2	--	8,000	-122.8	16cdd	5	8- 2-79	--	-123.2
35cbc-S1	3	8- 4-78	8,010	-126.7	18abb-S1	3	8- 8-79	8,980	-125.1
35dba	2	--	9,060	-145.8	18dcd-S1	3	8- 8-79	8,960	-125.7
(D-16-5)16ddb	2	--	9,820	-148.0	20cca	4	7- 5-79	--	-121.6
(D-16-6)1aca-S1	3	11- 8-78	8,320	-125.5	20ccb	4	7- 5-79	--	-122.7
	3	7-19-79	8,320	-124.9	20dcc	4	7- 5-79	--	-122.2
23cad	2	--	10,200	-145.2	21aab	5	8- 2-79	--	-123.2
27aaa	2	--	9,250	-137.0	21bad	5	8-30-78	--	-123.7
27adb	1	--	9,120	-77.8	21cbc	4	7- 5-79	--	-122.2
(D-16-7)9cbd-S1	3	10-13-78	7,600	-124.7	21dbd	5	8- 2-79	--	-122.5
	3	8- 3-79	7,600	-124.1	21dda	4	8-30-78	--	-123.8
13bac-S1	3	5-16-79	9,180	-119.8	22abd	5	8- 2-79	--	-122.3
17ccb-S1	3	9- 5-78	8,060	-122.5	22cab	4	7- 5-79	--	-121.8
21bbb-S1	3	9- 5-78	7,600	-124.8	22ccb	4	8-30-78	--	-122.1
22bbb-S1	3	9- 7-78	7,220	-127.9	22cdc	4	7- 5-79	--	-121.7
23ccb	2	--	7,020	-136.6	27bac	4	7- 5-79	--	-123.1
26adc-S1	3	5-11-79	7,120	-124.0		4	7- 5-79	--	-122.3
26bca-S1	3	8- 9-79	6,860	-125.5	28abc	4	8-30-78	--	-122.2
28cba	2	--	7,680	-123.7	28bad	4	7- 5-79	--	-121.9

7.1.2.1 MINE PLAN AQUIFERS

The only regionally recharged aquifer in the mine plan or adjacent areas is the Star Point-Blackhawk aquifer. This aquifer is the source for the Bear Canyon Spring and most of the large perennial springs in the vicinity. According to Mr. Bruce N. Kaliser, State Hydrologist (see Appendix 7-A), what is happening with the aquifer in the vicinity of the mine is "...to the north where principally the snow accumulates on Gentry Mountain, there is a recharge that is vertical down to the water table through the Blackhawk, and there is a recharge also from those channels which are from those drainages which are lying along the joint and fault bed. That vertical migration then reaches the Star Point and travels laterally along shear zones, prominent joint or faults and emerges where topography dissects the formation. I think all this is happening well below the mine."

Mr. Kaliser also mentioned, "I don't believe that at that locality (Bear Canyon Mine) there is precipitation recharging the aquifer, and so I am of the opinion that the mining operation will not affect the discharge on the spring (Bear Canyon Spring)."

The water in the aquifer is mainly used indirectly where it is the supply source for numerous springs. Groundwater development for the whole region is very low, with most water development being associated with surface water.

Other than Star Point, any aquifers in the mine plan area would be local perched water zones. Recharge available to any perched zone would be limited because of the topography and stratum geology of the area. The majority of water movement in the region is through faults and fractures, "But in entering the mine that Co-Op will be going into, it appears that faults evident in that mine underground are tight..." (Kaliser,'80), again limiting the amount of water available to any perched water zones present.

7.1.2.2 QUALITY AND QUANTITY OF GROUNDWATER

In 1981 the U. S. Geological Survey conducted a hydrological study of the upper drainages of the Huntington and Cottonwood Creeks (W.R.I. Open-file Report 81-539, Danielson). As part of this study spring water from various geological stratum units in the region were measured, sampled and analyzed. A summary of the results are shown in Table 7-2. Figure 7-1 shows the relationships of the formations.

It should be noted that none of the formations yielded a total dissolved solids higher than 750 mg/l and anything less than 1,000 mg/l T.D.S. is considered fresh water. Table 7-3 shows the comparison between the results of a chemical analysis (Danielson) done on Bear Canyon Spring and Federal and State water standards. It should be noted that the spring was within standards for all parameters measured.

Only a very small amount of groundwater quality information is available for the Bear Canyon Mine Vicinity. As part of the above mentioned study, field measurements and chemical analysis were performed on

TABLE 7-2

Summary of chemical characteristics of spring waters from different water-bearing zones in and adjacent to the upper drainages of Huntington and Cottonwood Creeks

	pH (units)	Temperature (°C)	Milligrams per liter: Dissolved calcium	Dissolved magnesium	Dissolved sodium	Dissolved potassium	Dissolved chloride	Dissolved sulfate	Dissolved solids	Bicarbonate
North Horn Formation										
No. Samples	51	51	51	51	51	51	51	51	43	51
Mean	7.5	6.3	61	29	19	.9	9.8	32	290	320
Minimum	6.3	.1	15	2.0	1.2	.2	1.2	2.1	63	49
Maximum	8.5	17.0	100	63	94	1.9	54	180	633	500
Price River Formation										
No. Samples	18	18	18	18	18	18	18	18	17	18
Mean	7.5	6.3	63	18	5.7	1.3	5.1	23	220	260
Minimum	6.5	3.8	12	2.9	1.4	.4	1.5	3.7	50	39
Maximum	8.2	16.0	87	51	39	3.4	18	120	524	427
Castlegate Sandstone										
No. Samples	9	9	9	9	9	9	9	9	9	9
Mean	7.5	5.6	60	29	7.1	1.3	5.6	33	290	300
Minimum	7.1	2.2	41	14	2.1	.9	3.6	4.0	163	183
Maximum	8.1	7.5	79	41	23	2.4	14	110	385	370
Blackhawk Formation										
No. Samples	31	31	31	31	31	31	31	31	30	31
Mean	7.4	6.1	57	19	4.1	1.1	4.3	21	220	250
Minimum	6.3	.1	15	2.0	1.2	.2	1.2	2.1	53	49
Maximum	8.1	13.0	98	52	16	3.5	16	120	539	460
Star Point Sandstone										
No. Samples	19	19	19	19	19	19	19	19	18	19
Mean	7.3	6.6	75	40	8.0	2.0	6.9	77	370	350
Minimum	6.8	2.8	48	3.0	.1	.9	2.7	13	213	244
Maximum	8.4	11.0	120	89	26	4.9	27	300	750	427
All Units										
No. Samples	128	128	128	128	128	128	128	128	132	128
Mean	7.5	6.3	62	27	11.0	1.2	7.1	34	295	300
Minimum	6.3	.1	12	2.0	.1	.2	1.2	2.1	50	39
Maximum	8.5	17.0	120	89	94	4.9	54	300	750	500

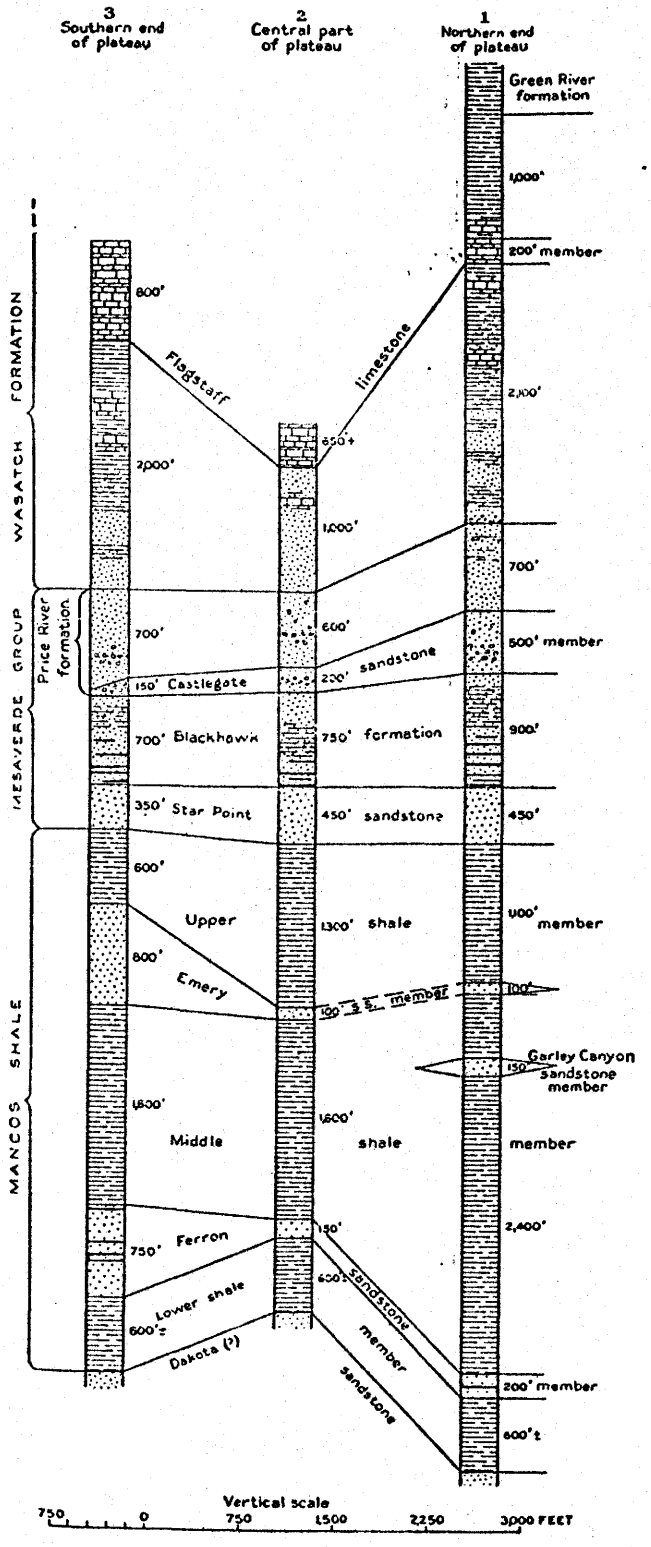


FIGURE 7-1 - COLUMNAR SECTIONS OF ROCKS IN THE WASATCH PLATEAU COAL FIELDS

TABLE 7-3

COMPARISON OF BEAR CANYON SPRING WATER QUALITY DATA W/STANDARDS
OCTOBER 3, 1977

	Spring	Federal Drinking Water Criteria	Utah Division of Health Water Standards	
			Domestic Water Class 1A	Aquatic Life Class 3A
pH (units)	6.8	6.5 - 8.5	6.5 - 9.0	6.5 - 9.0
Temp (C°)	9.5	----	----	less than 20
Spec Cond (umhos)	550	----	----	----
TDS (mg/l)	303	500	Case by case basis	
Iron (mg/l)(total-dissolved dissolved)	----	0.3 total	----	0.05
Sulfate (mg/l)	26	250	----	----
Chloride (mg/l)	4	250	----	----
Calcium (mg/l)	78	200	----	0.002
Magnesium (mg/l)	30	150	----	----
Sodium (mg/l)	4.1	200	----	----
Bicarbonate (mg/l)	310	500	----	----
Carbonate (mg/l)	0	----	----	----
Fluoride (mg/l)	.1	0.7 - 1.2	1.4 - 2.4	----
Silica (mg/l)	6.6	----	----	----
Total ALK as $CaCo_3$	250	----	----	----
Boron (mg/l)	.02	----	----	----
Potassium (mg/l)	1.1	----	----	----
Strontium (mg/l)	.28	----	----	----

TABLE 7-4

Field determinations of discharge, specific conductance, pH, water temperature and alkalinity at selected springs -- Continued

LOCATION	GEO-LOGIC UNIT	DATE OF SAMPLE	ALTI-TUDE	DIS-CHARGE (GAL/MIN)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	ALKA-LINITY FIELD (MG/L) AS $CACO_3$
(D-16-7)26ADC-S1	211SRPN	78-04-27	7120.00	110	--	--	--	--
	211SRPN	78-05-26	7120.00	110	--	--	--	--
	211SRPN	78-06-09	7120.00	120	--	--	--	--
	211SRPN	78-06-23	7120.00	130	--	--	--	--

TABLE 7-4

Field determinations of discharge, specific conductance, pH, water temperature and alkalinity at selected springs -- Continued

LOCATION	GEO-LOGIC UNIT	DATE OF SAMPLE	ALTI-TUDE	DIS-CHARGE (GAL/MIN)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	ALKA-LINITY FIELD (MG/L) AS $CACO_3$
(D-16-7) 26ADC-S1	211SRPN	78-04-27	7120.00	110	--	--	--	--
	211SRPN	78-05-26	7120.00	110	--	--	--	--
	211SRPN	78-06-09	7120.00	120	--	--	--	--
	211SRPN	78-06-23	7120.00	130	--	--	--	--
	211SRPN	78-07-06	7120.00	150	--	--	--	--
	211SRPN	78-07-28	7120.00	150	--	--	--	--
	211SRPN	78-08-10	7120.00	160	--	--	--	--
	211SRPN	78-08-30	7120.00	155	--	--	--	--
	211SRPN	78-10-13	7120.00	165	--	--	--	--
	211SRPN	78-10-25	7120.00	160	--	--	--	--
	211SRPN	78-11-01	7120.00	155	--	--	--	--
	211SRPN	78-12-13	7120.00	145	--	--	--	--
	211SRPN	79-03-07	7120.00	135	--	--	--	--
(D-16-7) 26BCA-S1	211SRPN	78-05-25	6860.00	23	--	--	--	--
	211SRPN	78-08-10	6860.00	19	--	--	11.0	--
	211SRPN	78-10-11	6860.00	19	--	--	11.0	--
	211SRPN	78-11-07	6860.00	19	--	--	10.5	--
	211SRPN	78-12-13	6860.00	19	--	--	10.0	--
	211SRPN	79-06-14	6860.00	10	--	--	11.0	--
	211SRPN	79-06-28	6860.00	10	720	8.0	11.0	--
	211SRPN	79-07-20	6860.00	9.3	660	7.0	11.5	--
	211SRPN	79-08-22	6860.00	21	750	--	10.5	--
	211SRPN	79-09-17	6860.00	19	750	--	10.5	--
	211SRPN	79-10-16	6860.00	20	680	--	11.5	--
(D-16-7) 26CBB-S1	211SRPN	78-08-10	6950.00	57	--	--	11.0	--
	211SRPN	78-10-11	6950.00	57	--	--	10.0	--
	211SRPN	78-11-07	6950.00	57	--	--	10.0	--
	211SRPN	78-12-13	6950.00	57	--	--	10.0	--
	211SRPN	79-05-10	6950.00	44	--	--	--	--
	211SRPN	79-06-28	6950.00	30	820	7.6	10.5	--
	211SRPN	79-07-16	6950.00	27	710	7.0	12.5	--
	211SRPN	79-09-18	6950.00	65	760	--	9.5	--
	211SRPN	79-10-18	6950.00	60	750	--	11.0	--

	211SRPN	78-07-06	7120.00	150	--	--	--	--
	211SRPN	78-07-28	7120.00	150	--	--	--	--
	211SRPN	78-08-10	7120.00	160	--	--	--	--
	211SRPN	78-08-30	7120.00	155	--	--	--	--
	211SRPN	78-10-13	7120.00	165	--	--	--	--
	211SRPN	78-10-25	7120.00	160	--	--	--	--
	211SRPN	78-11-01	7120.00	155	--	--	--	--
	211SRPN	78-12-13	7120.00	145	--	--	--	--
	211SRPN	79-03-07	7120.00	135	--	--	--	--
(D-16-7)26BCA-S1	211SRPN	78-05-25	6860.00	23	--	--	--	--
	211SRPN	78-08-10	6860.00	19	--	--	11.0	--
	211SRPN	78-10-11	6860.00	19	--	--	11.0	--
	211SRPN	78-11-07	6860.00	19	--	--	10.5	--
	211SRPN	78-12-13	6860.00	19	--	--	10.0	--
	211SRPN	79-06-14	6860.00	10	--	--	11.0	--
	211SRPN	79-06-28	6860.00	10	720	8.0	11.0	--
	211SRPN	79-07-20	6860.00	9.3	660	7.0	11.5	--
	211SRPN	79-08-22	6860.00	21	750	--	10.5	--
	211SRPN	79-09-17	6860.00	19	750	--	10.5	--
	211SRPN	79-10-16	6860.00	20	680	--	11.5	--
(D-16-7)26CBB-S1	211SRPN	78-08-10	6950.00	57	--	--	11.0	--
	211SRPN	78-10-11	6950.00	57	--	--	10.0	--
	211SRPN	78-11-07	6950.00	57	--	--	10.0	--
	211SRPN	78-12-13	6950.00	57	--	--	10.0	--
	211SRPN	79-05-10	6950.00	44	--	--	--	--
	211SRPN	79-06-28	6950.00	30	820	7.6	10.5	--
	211SRPN	79-07-16	6950.00	27	710	7.0	12.5	--
	211SRPN	79-09-18	6950.00	65	760	--	9.5	--
	211SRPN	79-10-18	6950.00	60	750	--	11.0	--

TABLE 7-4
Continued

(D-16-7)27ADC-S1	211SRPN	78-08-10	7000.00	15	--	--	11.0	--
	211SRPN	78-10-11	7000.00	5.8	--	--	11.0	--
	211SRPN	78-11-07	7000.00	4.9	--	--	10.0	--
	211SRPN	78-12-13	7000.00	5.4	--	--	10.0	--
	211SRPN	79-05-10	7000.00	.0	--	--	--	--
	211SRPN	79-06-28	7000.00	.0	--	--	--	--
	211SRPN	79-08-22	7000.00	2.0	870	--	10.0	--
	211SRPN	79-09-18	7000.00	3.4	780	--	10.0	--
	211SRPN	79-10-18	7000.00	3.1	730	--	11.5	--
(D-16-7)35ABC-S1	111ALVM	78-10-13	6620.00	22	--	--	--	--
	111ALVM	78-11-08	6620.00	20	--	--	--	--
	111ALVM	78-12-11	6620.00	23	--	--	--	--
	111ALVM	79-05-11	6620.00	26	--	--	--	--
	111ALVM	79-06-28	6620.00	20	960	8.1	10.5	--

111ALVM	79-07-20	6620.00	21	900	7.2	10.5	--
111ALVM	79-08-07	6620.00	35	760	7.3	11.0	--
111ALVM	79-08-22	6620.00	38	1080	--	10.0	--
111ALVM	79-08-31	6620.00	35	--	--	--	--
111ALVM	79-09-17	6620.00	40	1090	--	9.5	--
111ALVM	79-10-16	6620.00	32	850	--	11.0	--

TABLE 7-5

Chemical Analyses of Water from Selected Springs

Location	(D-16-7) 26adc-S1	(D-16-7) 26bca-S1	(D-16-7) 26cbb-S1	(D-16-7) 35abc-S1
Geologic Unit	211SRPN	211SRPN	211SRPN	111ALVM
Date of Sample	10-3-77	8-9-79	8-22-79	8-9-79
Altitude	7,120	6,860	6,950	6,620
Hardness (as $CaCO_3$)	320	380	440	510
Noncarbonate Hardness (as $CaCO_3$)	64	61	94	200
Discharge (gpm)	75	15	54	9.5
Specific Conductance	550	690	830	900
pH	6.8	7.5	7.2	7.7
Water Temperature (°C)	9.5	11.0	10.0	10.0
Dissolved* Calcium (as Ca)	78	83	82	92
Dissolved* Magnesium (as Mg)	30	42	58	69
Dissolved* Sodium (as Na)	4.1	6.6	21	24
Sodium* Absorption Ratio	.1	.1	.4	.5
Dissolved* Potassium (as K)	1.1	2.3	2.7	3.9
Bicarbonate* (as HCO_3)	310	--	--	--
Carbonate* (as CO_3)	0	--	--	--

TABLE 7-5
(continued)

Location	(D-16-7) 26adc-S1	(D-16-7) 26bca-S1	(D-16-7) 26cbb-S1	(D-16-7) 35abc-S1
Alkalinity* (as $CaCO_3$)	250	320	350	310
Dissolved* Sulfate (as SO_H)	26	71	140	190
Dissolved* Chloride (as Cl)	4.0	8.1	7.3	15
Dissolved* Fluoride (as F)	.1	.2	.2	.2
Dissolved* Silica (as SiO_2)	6.6	7.6	7.4	10
Dissolved Solids,* Sum of Constituents	303	414	530	591
Dissolved** Boron (as B)	20	80	30	70
Dissolved** Iron (as Fe)	--	0	20	0
Dissolved** Strontium (as Sr)	280	360	430	490

*units of milligrams/liter
**units of micrograms/liter

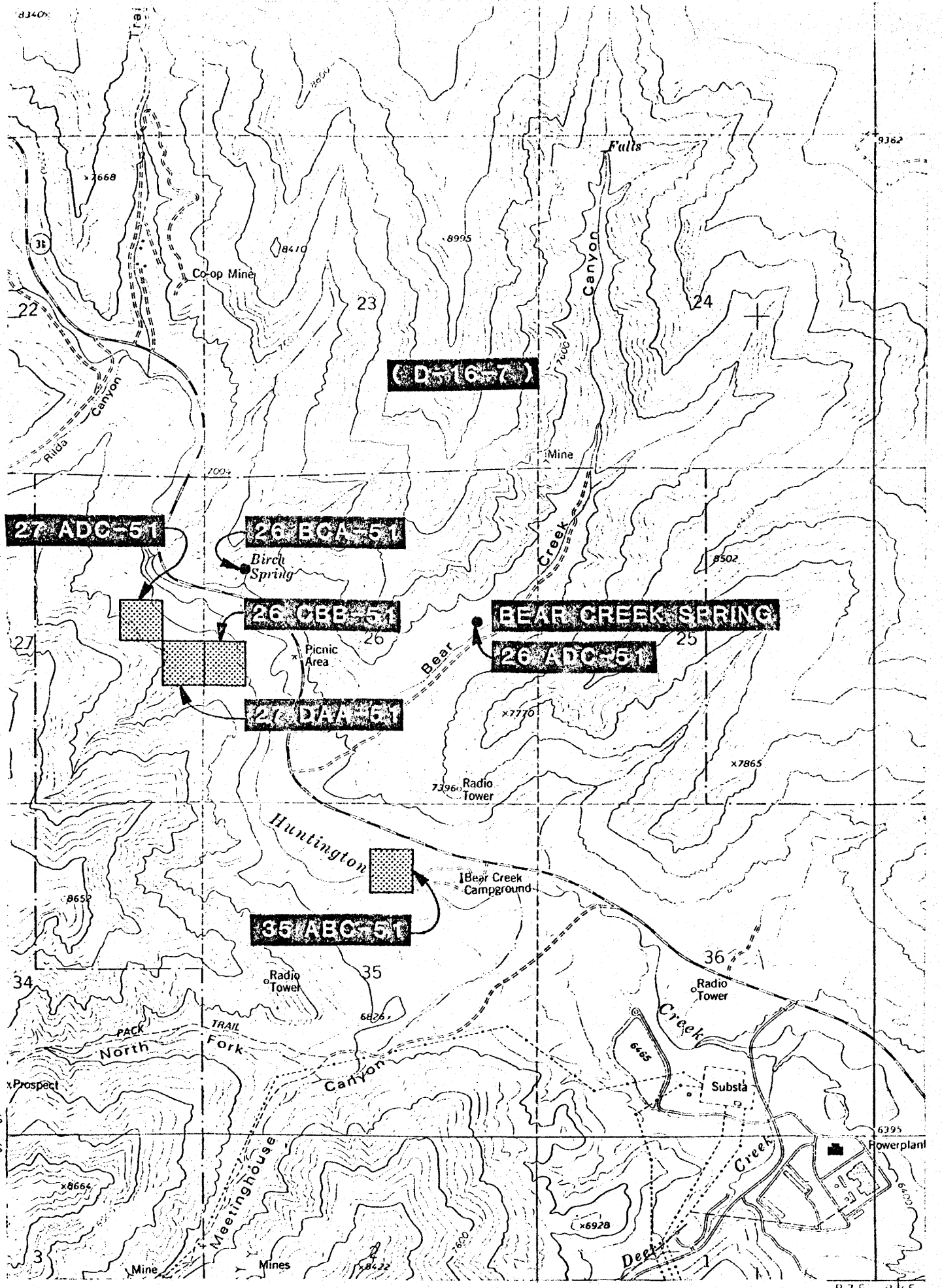


Figure 7-2 Location of springs in Table 7-4

selected springs. Tables 7-4 and 7-5 list the results of those measurements and analysis for the Bear Canyon Spring and for adjacent springs that were analyzed. (See Figure 7-2 for general locations of springs.)

7.1.3 EFFECTS OF MINING OPERATIONS ON GROUNDWATER

Danielson in the U.S.G.S. Open-file Report 81-539 states that:

> "The effects of underground coal mining on the water resources of the study area mainly are dependent on the amount of mine dewatering and the magnitude and a real extent of mine-related land subsidence....Where subsidence has not been extensive and where water-bearing zones that overlie the Star Point-Blackhawk aquifer are perched, it is unlikely that mine dewatering induces greater recharge to the groundwater system. Neither is it likely under these conditions that the flow of springs that issue from the perched zones or the rate of natural downward leakage into the Star Point-Blackhawk aquifer are affected by mine dewatering....It is unlikely that mine dewatering in the study area has had any adverse effect on the chemical quality of the groundwater."

The Bear Canyon Mine is a prime example of a mine with little subsidence and little mine dewatering, and what dewatering there is is from perched water zones. In addition Mr. Kaliser expressed the following:

> "In brief, my conclusion is that it is highly unlikely that the mine plan as presented to me by the Co-Op Company would interfere with the quantity or quality of any of those springs, particularly the one in question, the Bear Canyon Spring."

7.1.3.1 MINE DEWATERING

Water entering the mine will be stored in an underground tank and utilized for dust control on the roads and surface coal facilities and for

the mine bathhouse. Co-Op Mining Company possesses water rights for this purpose at the Trail Canyon portal and currently has an application before the State Water Rights Division to change the point of diversion to the Bear Canyon portal. If it becomes necessary to discharge the minewater other than as noted above it will be discharged to the sedimentation ponds. Co-Op Mining will monitor these discharges for quantity and quality.

7.1.3.2 MITIGATION AND CONTROL PLANS

An agreement between Huntington City and Co-Op Mining Company has been established to replace to the City any lost of culinary water from the Bear Canyon Spring, either in quality or quantity, due to mining operations, even though mining is highly unlikely to affect this spring.

Appendix 7-B contains a copy of this agreement between Huntington City and Co-Op Mining Company.

In the event that Co-Op Mining would need to replace water to Huntington City, the Company presently owns 300+ shares in the Huntington-Cleveland Irrigation Company and will purchase additional shares at some future date if necessary. In addition, Co-Op Mining Company carries liability insurance that includes coverage of water wells and springs (see Appendix 7-C).

7.1.3.3 GROUNDWATER MONITORING PLANS

If during mine operations, an inflow of groundwater is encountered from a point source with a sustained quantity of 1 gpm or greater over a 30-day period, a regular monitoring point of this groundwater will be maintained. Monitoring will be on a monthly basis. Samples will be taken of water quality and quantity with reporting done on a standard sampling chart. This monitoring will be carried out for a base-line period of one year or until the area is rendered inaccessible. In addition, the underground storage water will be monitored, and in the event discharging from the mine becomes necessary; discharged water will be monitored for quality and quantity. On a quarterly basis, a summary report will be submitted to DOGM which includes: a map of the underground working showing monitoring locations, identification of the source, sample qualities and quantities, and a narrative discussing current inflows, discharges, storage and uses of mine groundwater.

COP Development Spring, a small intermittent spring 300 feet northeast of Bear Creek Spring, will be monitored by Co-Op Mining (see plate 7-4).

Refer to 7.2.4 Surface Water Monitoring Plans for specifics on flow calculations and parameters tested for and refer to Figure 7-4 for reporting format.

CO-OP MINING CO.

P.O. Box 15809
Salt Lake City, Utah 84115
Phone (801) 467-4003

NOV. 26, 1982

SCALEHOUSE MODIFICATION

Wendell Owen

Wendell Owen

Docket # 84-040
Cause # ACT/015/025

UMC783.14 Geology Description

We have not vet received the contour maps or the results of the test samples for the development of the upper storage pad, so we are requesting an extension of time for that portion only of the modified plan. We agree to not enter or use that portion of the permit area for any purpose, for mining operations or further construction untill that portion of the modification has been completed.

UMC 783.25 Cross- sections, Maps and plans

(k) Please refer to Plate III-8-b-1 and III-9-b-2

Roads. Please refer to 784.24 of this package.

Surface structures will consist of; a shop, parts warehouse, bath house, mine offices, lamp house, truck scales, weighmans office, caretaker dwelling, mine run coal receiver bin, crushing and sizing structure, truck load-out bins, stockpile towers, and conveyors to carry coal to the storage and loadout sites. These structures will have cement footings and will be constructed with cincrete blocks and/or steel. These will each be used for the purpose as designed (shop for repair and maintenance of equipment, bath house for showers and lockers, etc.). They will be maintained by painting and repairing as needed. Moving parts such as conveyors will be maintained by regular greasing and by replaceing worn parts as needed.

Upon completion of mining operations, all structures will be removed, including the cement footings and the land will be returned to the approximate original configuration in preperation for final reclamation.

UMC 784.13 Reclamation Plan

(b)(4) Prior to disturbance of areas used for mining operations, the topsoil has been removed, or in the case of possible additional disturbance will be removed and stockpiled for future use. An example of procedure for removal is the area of modification for the truck scales. Por tions of this area were extremely rocky, while other portions had a topsoil depth of about 18 inches. The entire depth of topsoil was removed from the better areas, and enough topsoil saved to cover the entire area to a depth of at least 8 inches at the time of final reclamation. A berm has been made at the bottom of the stockpile. a sign has designated it as topsoil and it will be reseeded to protect it from wind and water erosion.

(b)(4)(vii) Applicant requests a meeting with the Division to discuss guidlines and help in devising a sampleing program as suggested in the ACR. (See ACR 817.116).

(b)(1) In order that roads may be used for access to remove and reclaim all of the other facilities, the roads will be the last area to be reclaimed. When all other r eclamation is completed, the roads will be reclaimed except if any portion of the road or roads are needed for post mining land use

(b)(3) Final configuration will be as near as possible to the original contour of the area before disturbance. For maps and cross-sections see Plate III-8-b and III-8-b-1.

(b)(5) Contemporaneous reclamation for embankments, topsoil stockpiles, and etc. will include the following seed amounts and procedures;

Crested wheat grass	6# PLS per A.
Yellow sweet clover	6# PLS per A.

The best results in reseeding that we have attained in this area has been to scarify the ground, broadcast the seed and harrow the seed in lightly, as late as possible in the fall and still have the planting under the winter snow. The proper time for this is the first week in November. Any snow that falls before that time will melt off again before winter. This method has been very successful without the use of mulch, as the seed germinates immediately after the melting of the snow from the moisture of the snow melt. The use of yellow sweet clover in the seed mix adds to the success of the planting as it is very easy to get started under almost any condition, provides a cover to assist the other plants in starting, and adds to the nutrients of the soil. It is often used as a rotation crop by farmers as a soil builder. It is bi-ennial and helps control erosion while the perennials get a full stand and native plants from adjacent areas spread into the reseeded area. Irrigation will not be used due to nature of the terrain as results would be spotty at best. It is not needed if the planting is under the snow as described above. The on ly exception will be in the case of small areas near a building that has water pressure for sprinkling. Contemporaneous reclamation of these small areas will take place at any time of the year as soon as the earthwork is completed. For these plantings a straw mulch will be used and irrigation will be by sprinkling.

Soil samples have been collected from various topsoil sites and tested by agriculture consultants. The results of these analyses and recommended nutrient additives are included under this cover as 'Exibit #1'.

UMC 784.13 (b)(5) cont.

2. Final abandonment

Upon completion of mining operation, the portal(s) shall be permanently sealed to prevent entry. Permanent seals will be designed to withstand any anticipated water pressure that may develop.

All machinery, equipment, and structures shall be removed from the permit area in not more than six months from the date of the completion of mining operations.

Dams, ponds, and diversions will be regraded to the approximate original contour of the land; except if that diversion is a barrow pit adjacent to, or a part of a road or pack trail that is to be left as a permanent road or trail.

Backfilling and grading

Disturbed areas will be backfilled and graded in not more than six months from the date of completion of the removal of surface structures, snow depth and weather permitting, or six months from the date the work can begin.
Backfilled material shall be pleced to minimize adverse effects on ground water, minimize off-site effects, and to support the postmining use.

Highwalls will be removed or reduced except where the highwall is permanently stable and/or said removal will endanger the life of the machine operator attempting the removal.

Backfilled areas shall be restored to a contour that is compatible with the natural surroundings and is capable of supporting the post mining land use. Where practicable and appropriate, such contour shall the approximate original contour.

Cut and fill terraces will be used where required in order to conserve soil moisture, ensure stability, and control erosion on final graded slopes. Terraces will meet the requirements of UMC 817.101 (4) (i) thruogh (iv).

Redistribution of soil will include covering all debris, coal or other materials constituting a fire hazard, in a place and manner designed to prevent contamination of ground or surface water. Soil will be compacted or otherwis stabilized in preparation for reseeding.

Revegitation.

The soil that has been redistributed and compacted will be covered with the surface material from the stockpiles, or other soil that has been tested and found to be suitable and able to support vegitative cover. Soil will be prepared for seeding by harrowing or final grading.

A description of the vegetation prior to surface disturbance is as shown on the following inventory taken by the Soil Conservation Service. Most of the disturbed area is along the boundary line between Pit 1 and Pit 2 of the SCS survey and would be a blending of the two rather than a distinct line. The seed mixture as shown in Chapter III Exibit 'h' in our permit application (also here enclosed) was chosen because it was recommended to us by the Utah State Experimental Station as being readily adaptable to the local climatic and soil conditions, having good potential for rapid development of cover, and contributing to possible post mining land use such as grazing or wildlife use. The plants from these seeds are not poisonous or noxious.

We have also enclosed a copy of appendix B table 1 of Utah Division of Wildlife resources 'Fish and wildlife Resource Information' of recommended seed mixtures that will benefit wildlife. Many of the plant species are the same on both seed mixture lists, but if in the opion of the OGM Division it would be better to modify the plan to use the seed mixture in table 1 in place of the one in Exibit 'h' we would be glad to do so.

CHAPTER III _ Exibit 'h'

SEED MIXTURE

Crested wheat grass	6# per acre
Luna pubescent wheat grass	2# per acre
Russian wild rye	6# per acre
Yellow sweet clover	6# per acre
Ladac alfalfa	2# per acre
Small burnet	2# per acre
Sage brush	1/4# per acre
Rabbit brush	1/4# per acre
Four wing salt brush	1/4# per acre

Amounts are given in PLS.

DESCRIPTION OF PRESENT VEGETATION

Upland Stony Loam (Pinyon-Juniper) Ecological Site

Two inventories of the Upland stony loam (P-J) ecological sites in the Bear Canyon area recorded the following vegetation as a percentage of air dry weight:

1) Pit 1, SW¼, Sec. 24, T16S, R7E. This site relates to the D1G soil.

2) Pit 2, NW¼, Sec. 25. T16S, R7E. This site relates to the D2E soil.

	Percent	
Grass and Grass-like Plants	Pit 1	Pit 2
Indian ricegrass	5	5
Salina wildrye	25	10
Squirreltail		10
Sedge		2
Needleandthread		2
Muttongrass	T	1
Forbs		
Buckwheat	1	
Mustard	1	2
Aster	1	2
Other	2	2
Cryptantha		2
Stickseed		2
Trees and Shrubs		
Rubber rabbitbrush		5
White fir	5	
Douglas fir	5	5
Pinyon pine	30	25
Juniper	10	10
Rocky Mountain juniper	10	5
Curlleaf mountainmahogany	5	
Big sagebrush		5
Bluerberry		5
Total annual Production (estimated in pounds/acre)	900	1500
Ecological rating	Good	Good

Table 1. **Recommended seed mixtures that will benefit wildlife through enhancement of moderately disturbed shrublands habitats of the montane ecological association. Also included are acceptable alternatives if seed for a plant species is not available. Alternatives marked with an asterisk (*) are for use in special treatments such as erosion control or roadbank stabilization. If disturbance was severe and total reclamation is needed, increase amount of seed by a factor of 2 to 3 times. Information assembled from Plummer, A.P., D.R. Christensen and S.B. Monsen. 1968. Restoring big game range in Utah. Utah Division of Fish and Game (now Utah Division of Wildlife Resources) Publication No. 68-3. 183 pp. Also from personal contacts with A. Perry Plummer.**

Species	North exposures and shady areas		Sunny exposures (south, west, east)	
	Broadcast	Drilled	Broadcast	Drilled
	-Pounds per acre-			
Grasses:				
Fairway crested wheatgrass	2	1	2	1
Smooth brome (southern strains)	4	2	2	1
Intermediate wheatgrass	4	2	2	1
Pubescent wheatgrass	0	0	2	1
Bluestem wheatgrass	0	0	1	1/2
Orchardgrass	1	1/2	1	1/2
Russian wildrye	0	0	1	1/2
Tall oatgrass	1	1/2	0	0
Forbs:				
Alfalfa (Nomad, Rambler, Travois, Ladak-equal parts)	2	1	2	1
Chickpea milkvetch	0	0	1	1/2
Utah sweetvetch	0	0	1	1/2
Yellow sweetclove	0	0	1	1/2
Arrowleaf balsamroot	1	1/2	1	1/2
Pacific aster	1	1/2	1	1/2

Mixture for tall mountain brush type, shaded sites.	
Species	Seeding per acre
	Pounds
Grasses:	
Smooth brome (southern strain)	5
Fairway crested wheatgrass	1
Intermediate wheatgrass	3
Orchardgrass (Utah grown)	2
Tall oatgrass	1
Mountain brome	1
Forbs:	
Alfalfa (creeping strains or Ladak)	
Pacific aster	1/4
Oneflower hellianthella	1/2
Showy goldeneye	1/4
Totals	15

Table 1. Continued

Species	North exposures and shady areas		Sunny exposures (south, west, east)	
	Broadcast	Drilled	Broadcast	Drilled
	-Pounds per acre-			
Shrubs:				
Rubber rabbitbrush	1/2	1/4	1/2	1/4
Douglas rabbitbrush	1/2	1/4	1/2	1/4
Big sagebrush	0	0	1/2	1/4
Fourwing saltbush	0	0	1	1/2
Totals	17	8 1/2	20 1/2	10 1/4
Shrubs for pits, major disturbance areas, cleat marks, and drilled areas:				
Antelope bitterbrush	1	1/2	2	1
Golden currant	1/2	1/4	1/2	1/4
Birchleaf mountain mahogany	1	1/2	1/2	1/4
Curlleaf mountain mahogany	0	0	1/2	1/4
Cliffrose	0	0	1/2	1/4
Green ephedra	1/2	1/4	1/2	1/4
Fourwing saltbush	0	0	1	1/2
Woods rose	1	1/2	1/2	1/4
Saskatoon serviceberry	0	0	1	1/2
Totals	4	2	7	3 1/2

GRC [illegible]

1-Plate [illegible] (please note that additions have been made to this map that includes the information asked for that was not on the original map turned in for the modification).

2- Plate III-7-b

Size of [illegible] basin

10 year 24 hour rainfall experience	2.4 in.	.2 ft.
75% runoff		.15 ft.
Acres draining into catch basin		1.2
[illegible] storage required		.18 A. ft.
Sediment storage required		.12 A. ft.
Basin area	2,000 sq. ft.	25 ft. x 80 ft.
Height sed. storage	2.6 ft.	
Height water storage	4 ft.	
Freeboard	1.4 ft.	

Culvert

Length	100 ft.
Diameter	60 in.

GRC [illegible] operation plan: Maps and Plans

Cross-section of topsoil stockpile. See Plate 8-b-1

Upper storage pad, request extention (refer to heading 783.14 of this package).

UMC 784.24 Transportation Facilities

Topographic map of roads and parking. Plate III-8-b

(a) Cross sections: Haul road Plate III-9-b (modification)
Supply road Plate III-8-b-1 Section B-B
Road cut and fill embankment III-13-b
Culvert III-12-b
Drainage ditch III-8-b-1 Section C-C

Haul roads will be a width of 30 feet road surface, not including the width of drainage and/or diversion ditches at the side of the road.

Supply and equipment roads will be 20 to 25 feet wide, not including the width of drainage and/or diversion ditches at the side.

The access road to the portal was constructed with a dozer by the cut and fill method. The average grade is 8% with sections of not more than 200 feet of up to 12%. Culverts are placed at the points were the natural drainages in the mountain intersect the road to minimize the amount of water that will flow down the divirsion ditch that was constructed along the side of the road. When completed, the road will be surfaced with a crushed road base material and treated with ammonium chloride for dust control. This road will be used by the people going to and from work and for vehicles hauling supplies to the mine. The access road to the screenage plant was an old existing road that has been graded and restored, and will be finished in the manner described above. It will be used by the people going to and from work at the screenage plant and for repair andmaintenance vehicles. These roads will be maintained by grading and reapplication of water and/or chemicals if needed. The main haulage road was an old existing road gradedand restored and when completed, will be surfaced with a crushed road base material and treated with ammonium chloride for dust control. The average grade is 4%, which remains consistant throughout the entire length of the road without steeper streches. Culvert are placed at the points where tha natural drainages intersect the road, but not exceeding 800 feet spacing. This road will be used for access to the minesite and to transport coal away from the mine.
For reclamation please refer to 784.13.

There is no public road within 100 feet of the permit area, except where the mine haul road joins t hat right of way.
Conveyor systems consist of covered belts which carry the coal from the screenage plant to the stockpile area. Maintenance includes regular servicing and replacing of worn parts when necessary. This will be included in the maintenance program we have for the entire operation. For dust control measures see 784.25.

784.25 Fugitive dust control plan

A copy is included, of a dust control plan that has already been submitted and approved by the Bureau of Air Quality, in the Bear Canyon permit application. Please seeChapter XI, Exibit XI-b

CO-OP MINING COMPANY _____DUST CONTROL (BEAR CANYON) May 5, 1980

	UNCONTROLED		FACTOR	CONTROLED	
HAUL ROADS	73.17 T.	PER YEAR	85%	3.476 T.	PER YEAR
ACCESS ROADS	3.59	"	85%	.54	"
COAL STORAGE	5.25	"	50%	2.625	"
CONVEYORS	10	"	99%	.2	"
CRUSHER	2	"	99%	.02	"
SCREENS	10	"	99%	.1	"
PRODUCT REMOVAL	5	"	50%	2.5	"
TOTAL	69.01	"		9 461	"

CO-OP MINING COMPANY_____DUST CONTROL (BEAR CANYON) May 5, 1980

STORAGE PILE (COAL)

AVERAGE SIZE OF PILE 4,000 T. (10,000 T. CAP. -- NORMALLY LESS THAN 1,000 T.)

THROUGH-PUT 200,000 T. PER YEAR

k = 9.125

s = 1.5

d = 175 (HIAWATHA WEATHER STATION -- 151 DAYS SNOW COVER --39 ADDITIONAL DAYS .01 IN. OR MORE OF RAINFALL)

$E = .05 \cdot \frac{20}{1.5} \cdot \frac{175}{235} \cdot \frac{15}{15} \cdot \frac{9.125}{90} = .0525 \cdot 200{,}000$ T. = 5.25 T. PER YEAR

CONTROL -- COAL IS SPRAYED WITH WATER AS IT IS BEING MINED IN ORDER TO MEET UNDERGROUND DUST CONTROL REQUIREMENTS. ADDITIONAL SPRAY EQUIPMENT WILL BE INSTALLED AT THE STORAGE SITE TO USE IF NEEDED.

CRUSHING (PRIMARY ONLY) 200,000 T. • .02 = 4,000# = 2 T. PER YEAR

CONTROL -- ENCLOSED AND VENT TO BAG HOUSE

SCREENING 200,000 T. • .1 = 20,000# = 10 T. PER YEAR

CONTROL -- BAG HOUSE

CONVEYORS AND TRANSFER POINTS 200,000 T. • .2 = 40,000# = 20 T. PER YEAR

CONTROL -- ENCLOSED AND VENT TO BAG HOUSE

ROADS (HAUL) -- s = 15
S = 20
W = 190

E = 5 • .47945 = 2.39725 @ 19333.33 MILES PER YEAR = 23.17 T. PER YEAR

CONTROL -- CHEMICAL STABILIZATION

ROADS (ACCESS) s = 15
S = 10
W = 190

E = 2.5 • .479452 = 1.1986 @ 6000 MILES PER YEAR = 3.59 T. PER YEAR

CONTROL -- CHEMICAL STABILIZATION

PRODUCT REMOVAL 200,000 T. PER YEAR • .05 = 5 T. PER YEAR

CONTROL -- WATER SPRAY

UMC 817.22 Topsoil removal

Please refer to 784.13 (b)(4) of this package.

Area of scale area modification 1.2 acres.

Area of upper pad modification, please refer to 783.14 of this package.

Results of analysis of soil; please refer to Exibit '1'.

UMC 817.23

Please refer to 784.13 (b)(4) and (b)(5) of this package.

UMC 817.24

Upon final reclamation, topsoil will be applied to a depth of 3 to 4 in.

Umc 817.25 Soil nutrients will be added to the topsoil as needed as indicated by the above analysis.

Docket # 84-040 Coop Mining Co.
Cause # ACT/015/025

UMC 784.23 Operation Plan: Maps and Plans

The applicant has not completely addressed this requirement. Cross-sections of disturbed and undisturbed ditches have not been submitted. Cross-sections of the Bear Canyon stream channel were not certified prior to the March 1984 DOC/TD document. The April 30th response omitted no only the certification but also the original cross-sections.

See Appendix 3-2

UMC 784.14 Reclamation Plan: Hydrologic Balance

The applicant has not completely addressed this requirement. The applicant has not provided maps, plans and cross-sections to depict postmining drainage patterns. Clarification of a statement in the MRP regarding "horizontal drainage patterns," a postmining drainage map, cross-sections depicting postmining topography and drainage, specific measures for stabilizing reclaimed drainage channels and details on measures proposed for reclamation of the main stream channel where it is currently culverted were not submitted as required. The previous MRP had proposed a log check dam configuration for reclaiming the Bear Canyon stream channel. This proposal was removed by the April 30, 1984 response and the only inference to reclaiming the stream channel is the depiction of eight-inch riprap shown on Plate 3-2.

See Appendix 3-2 and Plate 3-2A
3-G (Road Reclamation Plan)
Scale House Approved Modification Letter-
Approvals end of MRP

Appendix 3-2

RECLAMATION PLAN - DRAINAGE CHANNELS

RECLAMATION PLAN - DRAINAGE CHANNELS

The following information is a direct excerpt from April 25, 1984 MRP Submittal and Approved Scale House Modification, October 12, 1983:

> Upon final reclamation, all disturbed areas will be recontoured to near natural configuration, drainage channels will be re-established.
>
> "PHASE # 4 DRAINAGE CHANNEL STABILIZATION AND RECONSTRUCTION
>
> In conjunction with the recontouring, all drainage areas will re-establish to approximate original configuration. In order to minimize the loss of soil, all drainages will be lined with hygronomy blankets for approximately 10 feet above and below the areas of disturbance. In addition, where conditions warrant, rock rip rap may also be utilized to add yet another parameter of stability." (excerpt Chapter 3, pg. 3-119)

Plate 3-2A illustrates the postmining alignment of the stream channels and those areas where additional rip-rap is anticipated.

The above procedures coupled with the use of soil tac in application has proven an excellent method of stabilization of disturbed areas until vegetation is re-established. Rate of application is discussed in detail Chapter 9, pages9-16, April 26, 1984 MRP Submittal.

That portion of Bear Creek which is presently culverted is to be reclaimed as stated in the Approved Scale House Modification October 12, 1983. For convenience a copy of that approved plan is attached herein with the addition of the Engineering Certification as requested on May 11, 1984.

PHASE # 4 DRAINAGE CHANNEL STABILIZATION AND RECONSTRUCTION

In conjuntion with the recontouring, all drainage areas will re-establish to approximate original configuration. In order to minimize the loss of soil, all drainages will be lined with hygronomy blankets for approximately 10 feet above and below the areas of disturbance. In addition, where conditions warrant, rock rip rap may also be utilized to add yet another parameter of stability.

REF: August 18th letter NOV N83-5-7-1

MODIFICATION DIFICIENCIES

UMC 817.44 Hydrolgic Balance: Stream Channel Diversions

The methodology which the Co-Op Mining Co. contemplates implementing upon final abandonment and reclamation of that portion of Bear Creek in the vacinity of the Scale house are as follows:

1. To use a large track mounted excavator in conjunction with a small backhoe and crawler tractor to remove the 60' culvert and to regrade the opposing banks on approximately a 3 to 1 slope to facilitate revegetation and to enhance the establishment of a riparian zone. (Note fig. 1 for the present stream configuration and projected after reclamation).

2. To construct small holding ponds along the channel utilizing native materials. The actual methodology is to incorporate 2 logs approximately 10 to 14" in diameter, trench into the bank back approximately 10' on both sides of the creek channel, secure the logs together in a stacked manner with 36" anchor bolts, buried for approximately 10 feet with approximately 36" of fill material decreasing to 0" as the stream channel is approached. An 18" wide by 5" deep notch cut along the top of the upper log in the center of the creek channel, to create a centralized spill-way. Once the logs are secured into the channel, rock rip-rap should be laid on the up stream side to a height equal to the height of the log retainer and continued up stream for a distance of 36" decreasing in height so as to be level with the original rip-rapped channel. Then by utilizing a backhoe, a pit approximately 3' in diameter should be dug at the fall line of the spillway and lined with large rock 2' +. The log-pond configuration should be repeated at approximately 50' intervals along the course of the creek channel to create a stepped configuration along the area of disturbance.

   The intent of the holding ponds created by the log-rock dam is to fill with sediment and minimize the down stream migration

of this potentially detrimental source of silt and convert it into a potentially beneficial, enriched, growth media to facilitate the enlargement and establishment of riparian vegetation. Over a course of time the water holding capability of the ponded area will decrease as the ponds fill with sediment, however, the small ponds at the base of the spillway should remain relatively free from sediment and due to the small surface areas and depth, they will hold water over an extended period during dry seasons. A diagram is attached for your review. (See fig. 2).
The methodology is one which has been successfully implemented by myself on various areas to facilitate both water holding and enhancement of riparian zones and has been proven successful.

UMC 817.44 Paragraph 2

A 93-R and a 404 permit have been applied for. See appendix "A", and a copy of the approvals will be forwarded to your office on our recieval.

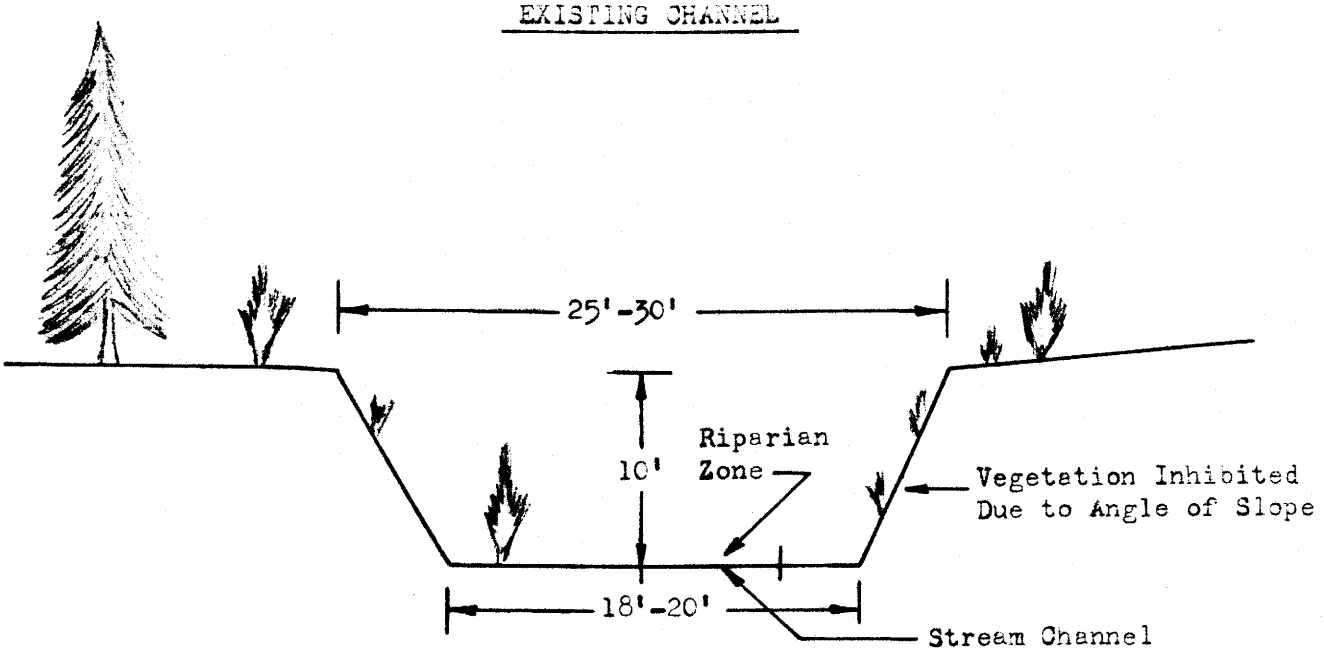
UMC 817.47 Hydrologic Balance

Co-Op is committed to use 12+ material in lieu of D-50 unless The Division of Oil, Gas, & Mining recommends an alternative.

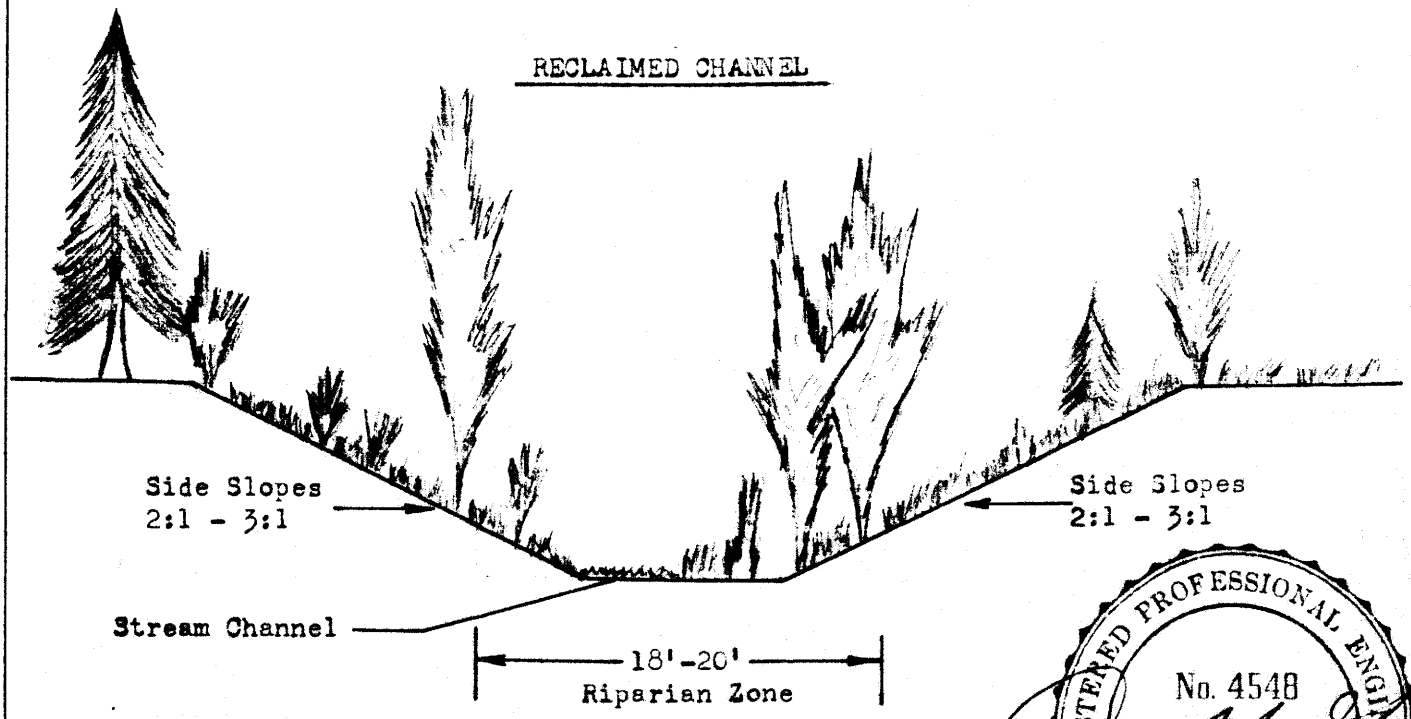
UMC 817.103 Covered Coal & Acid & Toxic Forming Materials

The sample was taken from that portion of Trail Canyon which Co-Op anticipates final reclamation in the near future. The specific site was at the toe of the slope where coal was historically stockpiled, approximately 800' above the Load-out facility.
The additional data is attached under appendix B

EXISTING CHANNEL



RECLAIMED CHANNEL

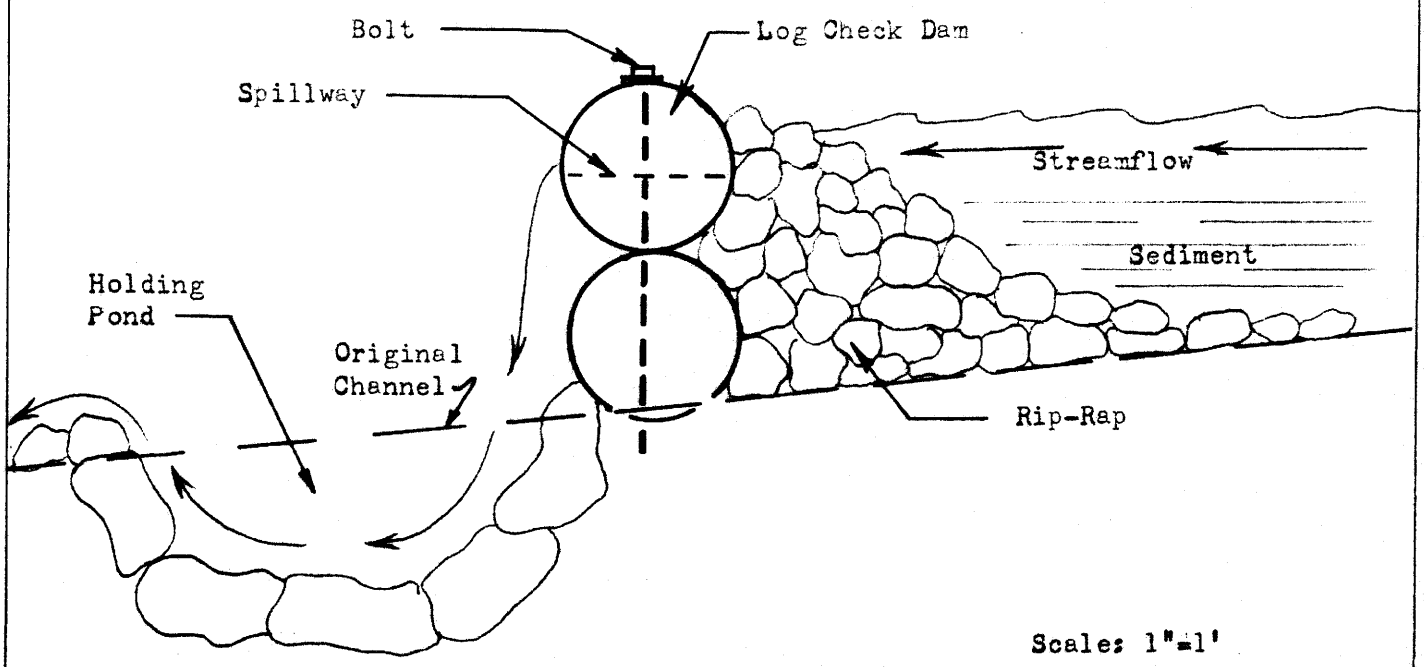


REGISTERED PROFESSIONAL ENGINEER
No. 4548
DAN W.
GUY
6/24/84
STATE OF UTAH

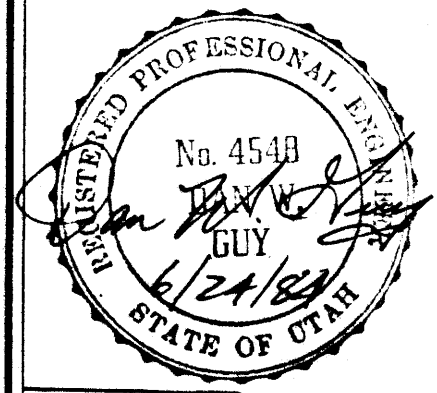
BEAR CANYON STREAM CHANNEL	SCALE 1"=10'	FIGURE NO. 1

JUN 25 1984

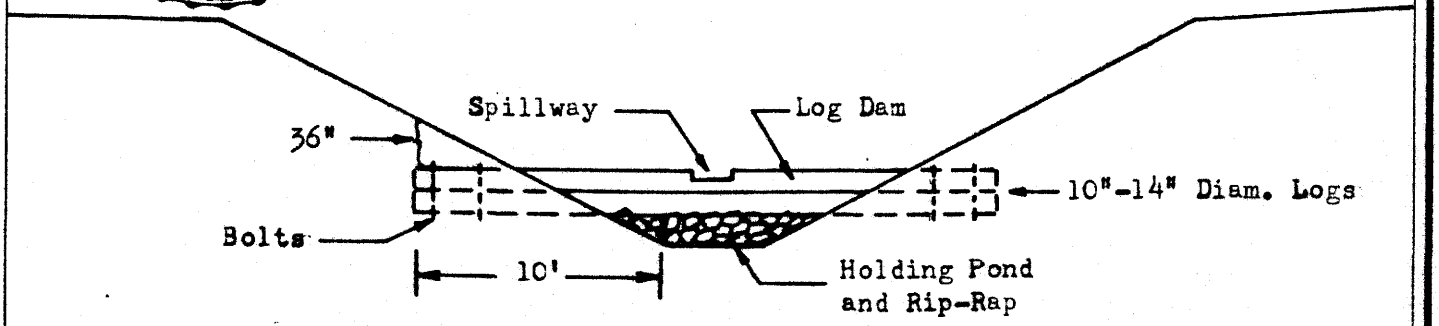
SIDE VIEW



Scale: 1"=1'



END VIEW
(Looking Upstream)

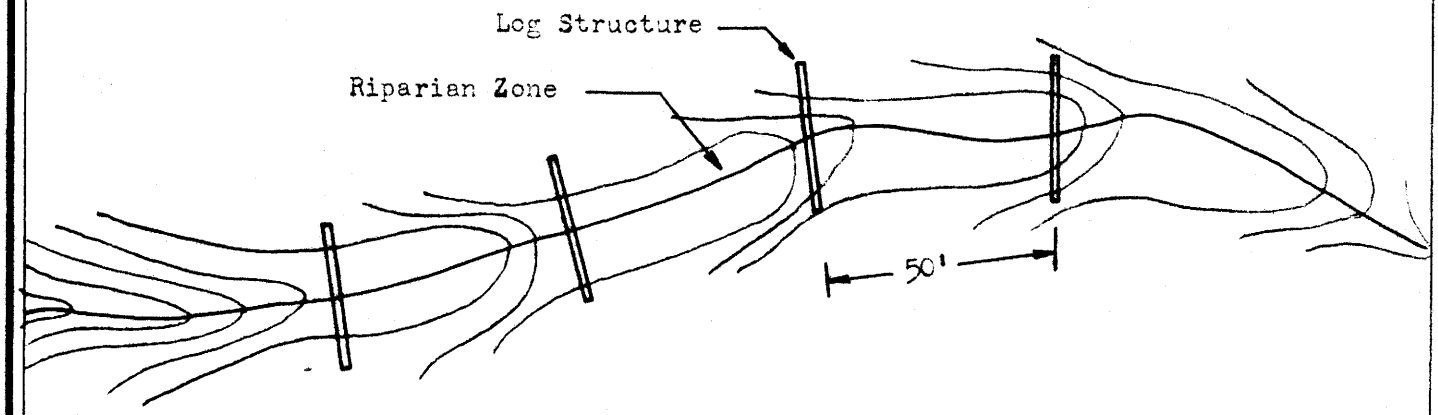


Scale: 1"=10'

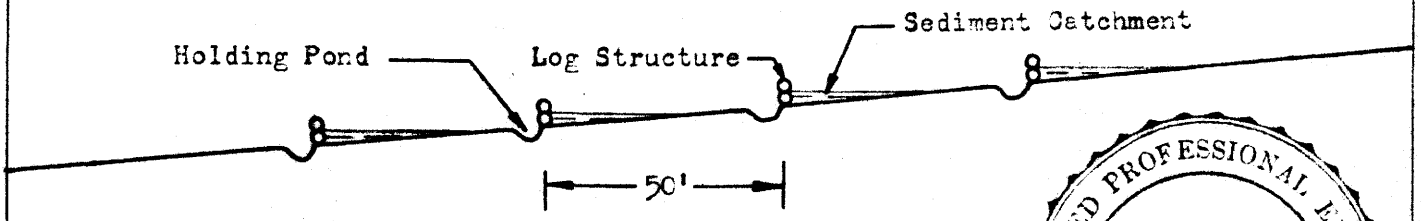
LOG CHECK DAM AND HOLDING POND	SCALE: AS SHOWN	FIGURE NO. 2

JUN 25 1988

PLAN VIEW



PROFILE



REGISTERED PROFESSIONAL ENGINEER
No. 4540
BRIAN W. GUY
6/24/84
STATE OF UTAH

ENHANCED STREAM CHANNEL	SCALE: 1"=40'	FIGURE NO. 2-A

JUN 25 1984

STATE OF UTAH
NATURAL RESOURCES
Oil, Gas & Mining

4241 State Office Building • Salt Lake City, UT 84114 • 801-533-5771

Scott M. Matheson, Governor
Temple A. Reynolds, Executive Director
Dr. G. A. (Jim) Shirazi, Division Director

October 12, 1983

Mr. Wendell Owen
Co-op Mining Company
P. O. Box 1245
Huntington, Utah 84528

RE: Scalehouse Modification
Final Approval
Bear Creek Canyon Mine
ACT/015/025
Folder Nos. 3, 4 and 7
Emery County, Utah

Dear Mr. Owen:

The Division has reviewed all material submitted by Co-op Mining Company for the proposed scalehouse permit modification and have, to the best of our ability, found that it meets all requirements set forth under Title 40-10 UCA 1953 (Regulation of Coal Mining and Reclamation Operations), and UMC 700 et seq. (Surface Effects of Underground Coal Mining Activities).

Approval of the proposed scalehouse modification for the Bear Creek Canyon Mine permit is hereby granted and utilization of this facility may lawfully commence.

If you have any questions, please feel free to call.

Sincerely,

JAMES W. SMITH, JR.
COORDINATOR OF MINED
LAND DEVELOPMENT

JWS/EH:btb

cc: Carl Kingston, Co-op Mining Company
R. Daniels, DOGM
E. Hooper, DOGM
J. Helfrich, DOGM
J. Whitehead, DOGM

UMC 784.20 Subsidence Control Plan

The applicant has not completely addressed this section. A survey of renewable resource lands has not been presented. The applicant's assessment of the effects of potential subsidence on renewable resource lands has no been included. NOTE: the issue of renewable resource lands was raised under the heading UMC 784.20 in the February 24, 1983 and August 31, 1983 DOC/TD documents. This issue was inadvertently omitted from the March 1984 DOC/TD document by the Division.

See Appendix 3-5-8
Survey Renewable Resource Lands and Potential of Subsidence Impacts

APPENDIX 3-5-8

SURVEY RENEWABLE RESOURCE LANDS AND POTENTIAL OF SUBSIDENCE IMPACTS

SURVEY OF RENEWABLE RESOURCE LANDS
CO-OP BEAR CANYON PERMIT AREA AND
POTENTIAL IMPACTS OF SUBSIDENCE

On June 13, 1984, an aereal survey was conducted of the entire Bear Canyon Mine Permit Area as well as all surrounding areas which could feasibly be impacted by subsidence. The results of that survey are as follows:

(1) Hydrologic Balance: There are no seeps and/or springs above the area of the coal beds. No surface water was observed other than Bear Creek which lies beyond the potential area of subsidence.

(2) Timber: There is no marketable timber within the area and the terrain is so steep as to preclude the establishment and/or harvest of such.

(3) Vegetation (Ref. grazing): The bulk of the area is high priority wildlife habitat. Potential impacts were evaluated in cooperation with UDWR Personnel. The results of that evaluation are discussed under Impacts.

The terrain is inhospitable to domestic grazing and is not utilized as such under present or future land use practices.

(4) Fish and Wildlife: The absence of water precludes the presence of fish. The entire area of influence is utilized by a wide variety of wildlife.

(5) Paleo-Archeo: There are no known sites within the area as documented by ground Paleo-Arch survey, Appendix 5-1.

(6) Man-Made Structure: There are no man-made structures within the area of influence other than a small unauthorized jeep trail on the northern rim of the permit area.

(7) Minerals, Oil & Gas: There are no oil and/or gas wells within the area and no known mineral reserves.

Potential Impacts

No negative impacts to renewable resources are anticipated other than potential impacts to wildlife.

Mr. Larry Dalton, Resource Analyst Utah Division of Wildlife Resources and the State's foremost authority on potential impacts of subsidence on wildlife, inspected the site on June 18, 1984. The results of that investigation in part are as follows:

Considering the absence of spring, water sources, the negative potential impacts of subsidence within the Bear Canyon Permit Area could easily be offset by potential positive aspects.

On the negative side: Loss of riparian area and/or water sources is of greatest concern, followed by loss of vegetation from methane gas leaking to the surface from an underground works. Considering the lack of riparian area or water sources above the coal seam, this concern is not warranted. Secondly, Co-Op has never encountered methane gas underground so there is little concern relative to potential vegatation loss, and last, the loss of nests due to escarpment failure.

On the positive side: The tension fractures resulting from subsidence along the steep side hills are frequently utilized by big game as movement corridors. The fractures and rubble provide escape cover for a variety of wildlife species as well

as additional habitat for burrowing and denning animals. While there is concern over the potential loss of nests as a result of escarpment failure, there is also a potential for additional nesting sites to be created through this gravitational shearing of escarpment surfaces.

UMC 785.19 Underground Coal Mining Activities on Areas or Adjacent to Areas Including Alluvial Valley Floors in the Arid or Semi-Arid Areas of Utah

The applicant has not completely addressed this requirement. A map of unconsolidated stream laid deposits or surface and groundwater into and through stream laid deposits has not been submitted.

See Chapter 3 Section 3.6.8
Letter requesting a variance under UMC/SMC 785.19(c)(3)(ii)
Submitted June 25, 1984

Co-Op Mining Company
P.O. Box 1245
Huntington, Utah 84528

June 25, 1984

Mary Boucek
Division of Oil, Gas and Mining
4241 State Office Building
Salt Lake City, Utah 84114

Ref: Alluvial Valley Floors

Dear Mary:

The pre-mining land use of the small area adjacent to Bear Creek in the Co-Op Permit Area is undeveloped range land and is not significant to farming.

This area is the only area where an alluvial valley floor could possibly exist and as stated by the SCS, no farm lands lie within the permit area and based on availability of water, steepness of the terrain, type of soil, and amount of rock, no farm land could feasibly be developed.

Based on the above which is documented in the Co-Op Bear Canyon Mine MRP Revised, Co-Op requests a waiver of UMC/SMC 785.19 paragraphs d and e and all of Section 822.

Sincerely,

Melvin A Coonrod
Permitting & Compliance
Co-Op Mining Company

MC/njc

UMC 783.22 Land Use Information

The applicant has not completely addressed this requirement. Land productivity data obtained from the Soil Conservation Service (SCS) were not presented.

This information was provided and referenced in Chapter 4, Page 4-10 to Chapter 9 Appendix 9-B.

4.4.2.3 Land Capability and Productivity Before Any Mining

Present land capability and productivity will be only slightly reduced compared to the after mining capability. Mining activities have proceeded on the current lease areas of the Co-Op Mining Company historically with only minor effects on productive capabilities in terms of soils, topography, vegetation or hydrology. The soils indigenous to the area affected by the operations are described in Chapter 8. Vegetation is discussed in Chapter 9.

Surface water in the permit area is limited to surface run-off that flows most heavily during the spring and early summer months and then normally dry up. The quality and quantity of this water and of the ground water will be identified in Chapter 7.

4.4.2.4 Land Productivity Before Mining in Terms of Average Yield of Food, Fiber, Forage or Wood Products

Land productivity in terms of plant products

before any mining will not differ greatly from future productivity. Early settlers depended upon range land for grazing sheep, cattle and horses. Timbering was active, but on a much smaller scale than grazing. Early settlers needed fenceposts, corral poles, house logs and railroad ties.

The permit area affected by Surface operations and facilities of the underground Bear Canyon mine is capable of supporting limited grazing and recreational uses. Farming in the area is prohibited by the steep and rocky terrain.

Current and future land use will suit the physical features of the mine plan area, which is mostly steep and rocky. Such land is well suited for management as a multi-use area and coal mining fits appropriately into the overall land use scheme.

Land productivity data were obtained from the U.S. Soil Conservation Service.

United States Department of Agriculture
Soil Conservation Service
350 North 4th East
Price, Utah 84501

September 26, 1983

Mel Coonrod
Co-op Mine
P. O. Box 358
Elmo, Utah 84521

Dear Mel,

Trail Canyon Reference Area:
Pinyon-Juniper Grass Site
The production is 650 lbs herbage production for this year. The range site conditon is good.

Trail Canyon Riparian Reference Area:
The production is 2,650-3,000 lbs/acre. The condition is fair.

Bear Canyon Comparative Area:
Pinyon-Juniper Grass Site
The production is 600 lbs/acre. The range site condition is fair.

Geoarge S. Cook
Range Conservationist

UMC 783.25 Cross-Sections, Maps and Plans

The applicant has not completely addressed this requirement. The following remains incomplete:

(a) The elevation and locations of test borings and core samplings were not supplied.

(c) Columnar outcrop sections denoted on Figure 2 in Appendix 6-A have not been located and identified on a map.

(d) A coal cropline map was submitted but strike and dip of the coal to be mined was not addressed.

(f) The extent of subsurface water on Plate 3-4 was not characterized in a cross-section.

The remaining items, (e), (g), (h), (i) and (l) were completely addressed.

See Plate 3-4A end of Chapter 3.

UMC 784.17 Protection of Public Parks and Historic Places

The applicant has been given an extension to June 30, 1984 to complete the requirements of this section.

See Appendix 5-1

APPENDIX 5-1

PALEO-ARCHEOLOGICAL SURVEY

SENCO-PHENIX

ARCHEOLOGICAL SAMPLING SURVEY OF THE BEAR CANYON MINE LEASE EXTENSION PERFORMED FOR THE BEAR CANYON/CO-OP MINE THROUGH ENVIRONMENTAL INDUSTRIAL SUPPLY

In accordance with State of Utah Guidelines
in Emery County, Utah
State of Utah Antiquities Permit No. 1106

SP-UT-42
SENCO-PHENIX
June 19, 1984

John A. Senulis
Principal Investigator

Abstract

A 10% sample survey was performed on the Bear Permit area for CO-OP Mining by John A. Senulis of SENCO-PHENIX under regulation of the Office of Surface Mining, Utah Division of Oil, Gas and Minerals, and the Utah State Historic Preservation Officer.

No cultural resources were located and the probability of undetected remains is slight. Archeological clearance is recommended, particularly since there will be no or minimal surface impact from this project.

Project Area

The 750 acre Bear Permit Area is located in the W½/W½ of Section 24, the E½ and the E½/W½ of Section 23, the S½ of Section 14, and the N½/NE¼ of Section 26, all Township 16 South, Range 7 East, Emery County Utah. There will be no, or minimal surface impact within the new permit area. Potential impacts would be from subsidence caused by abandoned mine shafts. The project is shown on the U.S.F.S. Manti-LaSal Map and U.S.G.S. 7.5' Quad: Hiawatha, UT (1978).

Specific Environment

The specific project area is extremely rugged, mountainous terrain with a topographical form of dissected uplands. Elevations range from 6800 to 8990 feet. Most of the terrain is steep with common grades of 15-20°. The one source of permanent water near the project area is Huntington Creek, ca. 3/4 mile southwest of the project area. Bear Creek, which flows much of the year, is roughly the eastern boundary of the permit area. Soils are generally colluvium forest soils on the slopes with clay loams on the ridges and in the valleys. The valley soils have a heavy gravel content of quartzite, lignite and scoria. Sandstone and shale are the predominant bedrock outcrops.

Predominant vegetation in the drainage areas is Ponderosa Pine, Douglas Fir, Aspen, Limber Pine, and Juniper with willow, rabbitbrush, sagebrush, muhly, squirreltail, milkvetch, lupine, woods rose, scarlet

gilia, arrow-leafed balsamroot, foothills arnica and other associated grasses, forbs and shrubs. On the steep, rocky, rugged hillsides, the pine and juniper trees and other vegetation become sparse.

Archeological Potential

A files search at the Utah State Historic Preservation office indicated that no archeological surveys have been performed in the project area. Sites in Huntington Canyon are generally flake scatters, isolates, and rock shelters, with historic sites consisting primarily of evidence of mining, i.e. mine shafts, hardware, etc. Generally the prehistoric and earlier historic sites are located along the valley floor. The probability of locating significant archeological resources in the steep mountainous areas was considered remote.

Survey Strategy and Methodology

The survey strategy was based upon the belief that the most likely area for sites would be within Bear Creek Canyon. Therefore, the entire canyon was surveyed with particular emphasis on the sides for potential rock shelters, and on the canyon floor for isolates. A second portion of rugged uplands was surveyed with wandering random transects to insure adequate coverage of the diverse zones.

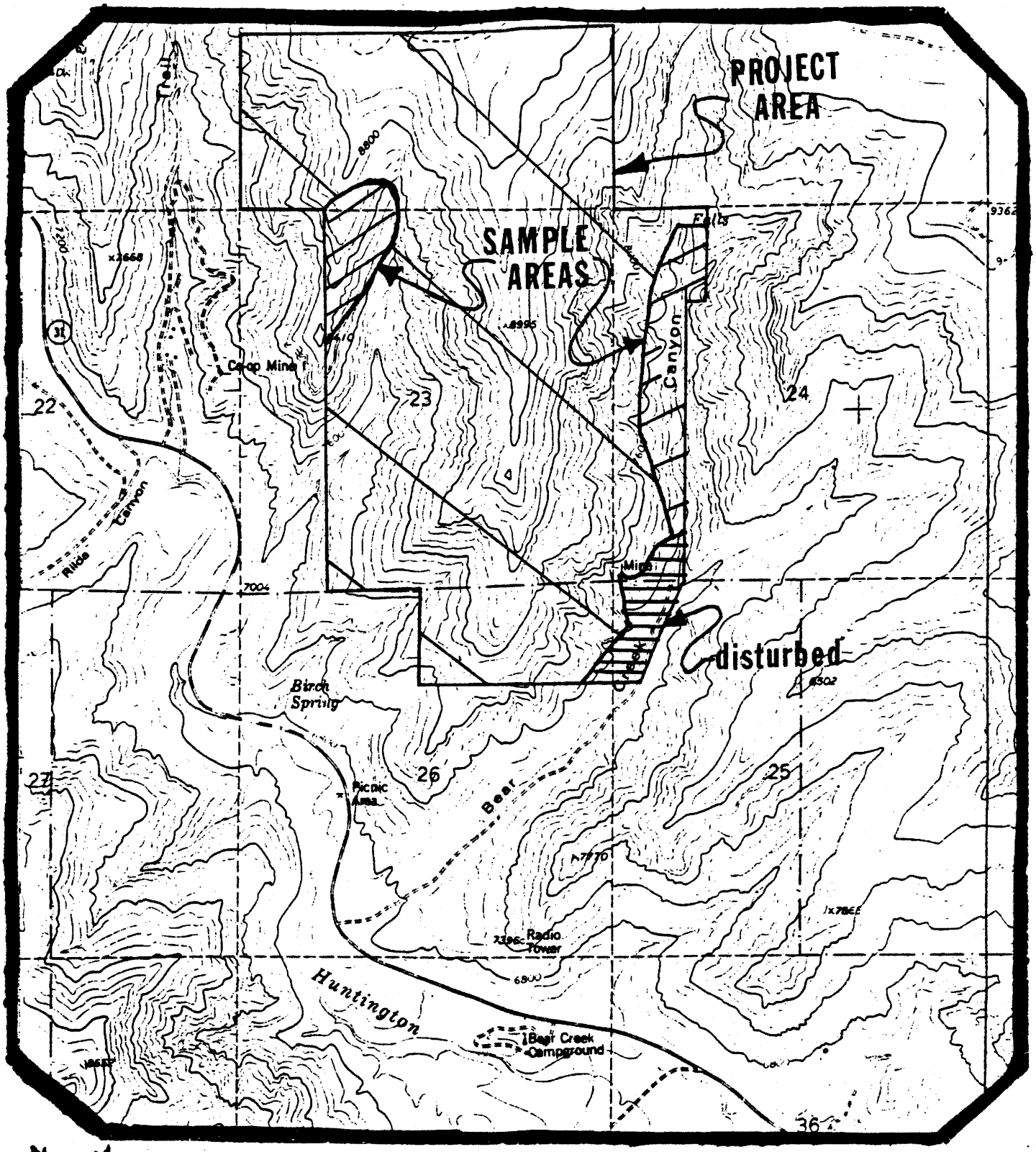
Survey Conditions

On June 18, 1984, John and Jeanne Senulis performed a walkover survey of the aforementioned areas. The sky was overcast for part of the survey with light mountain showers; however, the sky then cleared and the majority of the survey was conducted under sunny skies. The soils ranged from damp to dry, and the temperature was approximately 70° F. with calm winds except during the rain showers.

Findings and Recommendations

Outside of two modern campfires, no prehistoric or historic cultural resources were located in the steep, inhospitable terrain. No rock alcoves of sufficient size or configuration were discovered and the

entire valley floor showed evidence of occasional flash flooding. Because of the lack of findings, and the project's non-surface disturbing nature, archeological clearance is recommended.



BEAR CANYON MINE LEASE EXTENSION
CO-OP MINING COMPANY
SECTIONS 14, 23, 24, 26, T16S. R7E
EMERY COUNTY, UTAH
U.S.G.S. 7.5' QUAD: HIAWATHA, UTAH (1978)
SENCO-PHENIX (UT-42)
JUNE 18, 1984

SENCO-PHENIX
ARCHAEOLOGICAL SURVEYS
P.O. BOX 9197
SALT LAKE CITY, UTAH
84109


062
059
072
076
086
PROJECT AREA
21
15
14
5
13
18
19
6
13
Huntington
Castle Dale
Orangeville
T. 19 S.

JUN 25 1984

UMC 784.13 Reclamation Plan: General Requirements

Though the applicant completely addressed this requirement regarding deficiencies outlined in the March 1984 DOC/TD document, the applicant's submission of additional information April 30, 1984 changed what had been submitted and was complete prior to March 1984, thus rendering the MRP incomplete with reference to part (b)(4) of this regulation, the use of a soil substitute.

Co-Op Reply:

See Appendix 6-S

SCOPE:

Co-Op Mining Company, in an attempt to implement future reclamation on a previously disturbed mining site in Bear Canyon, Bear Canyon Mine, determined that they had a deficiency of approximately 1800 cu. yds. of top soil. In order to offset this deficiency, two courses of action were investigated:

1. To utilize existing material which was down cast along the old portal access road.

2. To purchase a suitable top soil off site and haul it to the proximity of the mine.

In order to determine feasibility and suitability of both the materials and the methods, the following soil inventory and survey were conducted:

Methodology

On March 24, 1984, M. A. Coonrod, Compliance and Permitting Co-ordinator for the mine, sampled soil along the old portal road, top soil purchased off site and the existing top soil pile. The sample procedure for each site is as follows:

Existing Topsoil Stockpile (Sample ID-P1)

A randomly selected spot was determined by walking 10 paces up the pile from a random point selected by throwing a marker onto the pile. A 14" tile spade was utilized to excavate a hole 24" in depth and approximately 18" in diameter. A sliver of soil approximately 1" x 4" was sliced from the top to bottom of the excavation. The material was placed in a clean plastic bag and sealed (approximately 3 lbs.) Rock larger than approximately 1" diameter were avoided in containerizing the sample.

APPENDIX 6-S

TOP SOIL SAMPLING

Loadout-Alternative Soil Substitute (Sample ID-P2)

Co-Op has purchased approximately 80 acres along the Price river, Carbon County, Utah. A portion of the site had the top soil stripped and stockpiled. The same sample methodology as implemented on the existing topsoil pile at the mine was utilized at this alternative soil substitute.

Road Fill (Sample ID FR-3, st 1,3 & 6)

This material was sampled at 200' intervals from the down slope of the fill in the area of the portal road intersection to the non-coal storage site along Bear Creek. Each sample was taken 3' from the toe of the downcast material. A 14" tile spade was used to excavate approximately 1' into the fill material and a grab sample (app.1 lb. of material) was taken at each site. All samples were consolidated into 3-5 gallon plastic buckets labled 1,3, and 6.

At the conclusion of the survey, all samples were consolidated and mixed. From this consolidated material, a sample of approximately 8 lbs. was placed into a clean plastic bag. All samples were hand carried to Standard Laboratories north of Huntington, Utah on March 24, 1984.

Results and Conclusions:

Attached are copies of the laboratory results. It appears that all materials on site as well as the off site substitute are compatable and capable of establishing and maintaining a diversive vegetative community consistent with the existing reference area.

Prior to implementing reclamation, all soil will be tested again to determine the need for both, type and quantity of desired fertilizers to insure rapid establishment of vegetation.

UMC 784.22 Diversions

(1) The applicant has not completely addressed this requirement. The map delineating drainage areas cuts off certain areas, rendering it impossible to calculate the watershed area on subareas AR-1, AU-2, AU-3, AU-4, AU-5 and AU-6. (2) The applicant has not sufficiently identified or explained the formulas used where results were taken from computer sheets or the coefficients used in calculations. (3) No ditch cross-sections have been presented and velocities have not been shown. (4) A table identifying riprap size based on velocity has not been presented. Format for and frequency of reporting regarding the groundwater monitoring plan have not been addressed.

(1) See revised Plate 7-5
(2) Attached as insert A
(3) See revised Plate 7-1
(4) Attached as Insert A

INSERT A

HYDROLOGY

-Summary of Culvert Sizes-

	Flow(cfs)	Vel.(fps)	Rip Rap	Slope(%)	Diameter	Required Headwater**
C-1R	10.2	9.5	12"	8.0	18"	27"
C-2R	12.1	9.5	12"	8.0	18"	36"
C-3R	16.4	9.5	12"	8.0	18"	27"
C-1U	8.8	12.3	24"+	15.0	30"	18"
C-2U	1.5	8.4	9"	15.0	15"	9"
C-3U	7.9++	5.7	6"	5.0	12"	36"*
C-4U	6.1++	5.1	6"	5.1	10"	36"*
C-5U	6.1++	5.0	N/R	4.8	10"	36"*
C-6U	.9	4.4	N/R	3.7	10"	12"
C-7U	10.3	9.7	12"	8.3	12"***(18")	27"
C-8U	8.8	13.0	24"+	15.0	18"	24"
C-9U	1.5	8.0	9"	7.3	15"	9"
C-1D	1.5	10.9	16"+	20.0	15"	9"
C-2D	4.8	9.6	12"	12.0	18"	15"
C-3D	1.2	5.2	6"	4.2	12"	9"
60" CMP	231.2	13.8	24"	3.4	60"	102"

*When capacity of culvert is exceeded flow continues down ditch to next culvert.

**From invert elevation.

***Existing 12" CMP to be replaced with 18" CMP at 8.3% slope.

+ Energy dissipating device could be used instead of rip rap.

++ A two foot high check dam of rip-rap is used to develop the headwater necessary for maximum flow through the culvert, excess flow continues down the ditch.

N/R - Not required

-Summary of Ditch Sizes-

All ditches are triangular "V ditch" with 1:1 side slopes. (See Plate 7.1 for typical.)

	Flow(cfs)	Vel.(fps)	Rip Rap Size**	Slope(%)	Depth Of Ditch	Depth Of Water
D-1R	10.2	6.8	6"	6.0	2'-0"	1'-6"
D-2R	12.1	6.8	6"	6.0	2'-0"	1'-6"
D-3R	10.4	6.8	6"	6.0	2'-0"	1'-6"
D-1U	1.5	3.5	N/R	4.0	1'-3"	0'-9"
D-2U	1.5	3.9	N/R	5.0	1'-3"	0'9"
D-3U	6.1	5.5	4"	5.0	1'-9"	1'-3"
D-4U	11.8	6.6	6"	5.0	2'-0"	1'-6"
D-5U	.9	3.5	N/R	7.0	1'-0"	0'-6"
D-6U	.9	3.5	N/R	7.0	1'-0"	0'-6"
D-7U	10.3	6.6	6"	5.0	2'-0"	1'-6"
D-8U	2.3	4.4	N/R	6.25	1'-3"	0'-9"
D-9U	1.8	5.0	4"	8.3	1'-3"	0'-9"
D-10U	1.5	5.7	6"	18.0	1'-0"	0'-6"
D-11U	7.6	7.9	9"	14.0	1'-6"	1'-0"
D-1D	.8	4.0	N/R	9.0	1'-0"	0'-6"
D-2D	1.5	5.5	4"	10.0	1'-3"	0'-9"
D-3D	1.0	5.2	4"	15.0	1'-0"	0'-6"
D-4D	4.8	5.3	4"	6.25	1'-6"	1'-0"
D-5D	7.2	6.2	6"	6.4	1'-9"	0'-9"
D-6D	1.2	4.4	N/R	6.25	1'-3"	0'-9"

*6" freeboard added to required flow depth.
** see Plate 7.1 for location of rip rap.
N/R - not required

Design Parameters Determination Procedure

Listed below are the various parameters, along with and the procedures used to obtain them, which were supplied to the computer programs used in calculating the runoff hydrographs and routings and the ditch and culvert sizings.

The equations used in the Hydro Plus III - SCS hydrograph program are listed this section, 7.2.5.2 Diversion Structures. The parameters that were used are as follows:

Basin Area - the areas where calculated, using a planimeter, from those outlined on Plate 7-5.

Basin Curve Number - this SCS runoff curve number was estimated using "A Guide to Hydrologic Analysis Using SCS Methods", Section 5. This section is included in the reference section. The soil of the mine plan area is best described by soil group "C". For the undisturbed areas the land use description is "woods or forest land" and the hydrologic condition "fair". Using these description a curve number of "73" was obtained. For disturbed areas the curve number "82" was used.

24-Hour Precipitation - the precipitation amounts for the various storm frequencies came from E. Arlo Richardson's "Estimated Return Period for Short-Duration Precipitation in Utah", the Hiawatha area.

Average Basin Slope - the slopes of the various areas outlined on Plate 7-5 were derived by dividing the total change in elevation by the hydralic length.

Hydralic Length - this length, also from Plate 7-5, is the length from the area outlet or mouth to the divide or point of highest elevation.

Basin Lag - this value was computed by the computer program with the computer using a minimum of 15 minutes.

The hydrograph reservoir routing program used the appropriate runoff hydrograph routed through the appropriate sedimentation pond, "A" or "B". Pond capacity per elevation and spill way capacity were determined from the cross sections and criteria shown on Plates 7-2 and 7-3.

From the parameters listed above, the computer program was able to generate runoff hydrographs. From these hydrographs the peak or maximum flow was used in the sizing of the ditches. For sizing the ditches and culverts the parameters used are as follows:

Ditch Depth - various ditch depths were tried, in 3" increments, until a depth was found that would handle the the maximum flow.

Culvert Diameter - the diameters were obtained by field measurement, unless noted otherwise. If the flow was larger than could be handled by the culvert a check dam 2' high of rip-rap is used to develop headwater for maximum flow through the culvert, excess flow continues down the ditch.

Manning Coefficient - the coefficients came from Van Te Chow's "Open-Channel Hydralics," For corrugated metal pipes and flumes, n=.023; for natural channels-straight, full stage, no pools with weeds and stones, n=.035.

Slope - for ditches the total change in elevation was divided by the total length, both values were obtained from Plate 7-1. For culverts the slope was obtained from field measurements.

To determine the headwater necessary for maximum flow through the various culverts the orifice computer program was run for the different size culverts being used in the mine plan area. The equations used in the program are listed on the individual printouts. The parameters supplied the programs are as follows:

D - diameter of culvert size being considered.

C - the ooefficient of contraction for orifices was obtained from King and Brater's "Handbook of Hydralics".

UMC 783.27 Prime Farmland

The applicant has not completely addressed this requirement. A letter from the SCS was not submitted as part of the MRP.

This letter was inadvertently ommitted and is attached as Appendix 8-C.

APPENDIX 8-C

PRIME FARM LAND

United States
Department of
Agriculture

Soil
Conservation
Service

P. O. Box 11350
Salt Lake City, UT 84147

November 25, 1983

Mel Coonrod
P. O. Box 1245
Huntington, UT 84528

Dear Sir:

Keith Beardall, District Conservationist, Price, Utah, has determined that no prime farmland occurs in the Bear Canyon area; the areas were outlined in red on the map furnished with your request.

The areas in sections 14, 23, 24 and 26 are too steep to be considered for prime farmland. Sections 22 and 25 are above existing irrigation systems, more than 10 percent of the surface layer consists of rock fragments coarser than 3 inches and/or too steep to be considered for prime farmland.

We are retaining the boundary map pertaining to the area for future reference. If you have need of further information, please call on us.

Sincerely,

FERRIS P. ALLGOOD
State Soil Scientist

cc: Keith Beardall, DC, Price, UT

Revegitation.

The soil that has been redistributed and compacted will be covered with the surface material from the stockpiles, or other soil that has been tested and found to be suitable and able to support vegitative cover. Soil will be prepared for seeding by harrowing or final grading.

A description of the vegetation prior to surface disturbance is as shown on the following inventory taken by the Soil Conservation Service. Most of the disturbed area is along the boundary line between Pit 1 and Pit 2 of the SCS survey and would be a blending of the two rather than a distinct line. The seed mixture as shown in Chapter III Exibit 'h' in our permit application (also here enclosed) was chosen because it was recommended to us by the Utah State Experimental Station as being readily adaptable to the local climatic and soil conditions, having good potential for rapid development of cover, and contributing to possible post mining land use such as grazing or wildlife use. The plants from these seeds are not poisonous or noxious.

We have also enclosed a copy of appendix B table 1 of Utah Division of Wildlife resources 'Fish and wildlife Resource Information' of recommended seed mixtures that will benefit wildlife. Many of the plant species are the same on both seed mixture lists, but if in the opion of the OGM Division it would be better to modify the plan to use the seed mixture in table 1 in place of the one in Exibit 'h' we would be glad to do so.

CHAPTER III _ Exibit 'h'

SEED MIXTURE

Crested wheat grass	6# per acre
Luna pubescent wheat grass	2# per acre
Russian wild rye	6# per acre
Yellow sweet clover	6# per acre
Ladac alfalfa	2# per acre
Small burnet	2# per acre
Sage brush	1/4# per acre
Rabbit brush	1/4# per acre
Four wing salt brush	1/4# per acre

Amounts are given in PLS.

UMC 784.13 (b)(5) cont.

2. Final abandonment

Upon completion of mining operation, the portal(s) shall be permanently sealed to prevent entry. Permanent seals will be designed to withstand any anticipated water pressure that may develop.

All machinery, equipment, and structures shall be removed from the permit area in not more than six months from the date of the completion of mining operations.

Dams, ponds, and diversions will be regraded to the approximate original contour of the land; except if that diversion is a barrow pit adjacent to, or a part of a road or pack trail that is to be left as a permanent road or trail.

Backfilling and grading

Disturbed areas will be backfilled and graded in not more than six months from the date of completion of the removal of surface structures, snow depth and weather permitting, or six months from the date the work can begin.
Backfilled material shall be placed to minimize adverse effects on ground water, minimize off-site effects, and to support the postmining use.

Highwalls will be removed or reduced except where the highwall is permanently stable and/or said removal will endanger the life of the machine operator attempting the removal.

Backfilled areas shall be restored to a contour that is compatible with the natural surroundings and is capable of supporting the post mining land use. Where practicable and appropriate, such contour shall the approximate original contour.

Cut and fill terraces will be used where required in order to conserve soil moisture, ensure stability, and control erosion on final graded slopes. Terraces will meet the requirements of UMC 817.101 (4) (i) thruogh (iv).

Redistribution of soil will include covering all debris, coal or other materials constituting a fire hazard, in a place and manner designed to prevent contamination of ground or surface water. Soil will be compacted or otherwis stabilized in preparation for reseeding.

UMC 784.13 Reclamation Plan

(b)(4) Prior to disturbance of areas used for mining operations, the topsoil has been removed, or in the case of possible additional disturbance will be removed and stockpiled for future use. An example of procedure for removal is the area of modification for the truck scales. Por tions of this area were extremely rocky, while other portions had a topsoil depth of about 18 inches. The entire depth of topsoil was removed from the better areas, and enough topsoil saved to cover the entire area to a depth of at least 8 inches at the time of final reclamation. A berm has been made at the bottom of the stockpile. a sign has designated it as topsoil and it will be reseeded to protect it from wind and water erosion.

(b)(4)(vii) Applicant requests a meeting with the Division to discuss guidlines and help in devising a sampleing program as suggested in the ACR. (See ACR 817.116).

(b)(1) In order that roads may be used for access to remove and reclaim all of the other facilities, the roads will be the last area to be reclaimed. When all other r eclamation is completed, the roads will be reclaimed except if any portion of the road or roads are needed for post mining land use

(b)(3) Final configuration will be as near as possible to the original contour of the area before disturbance. For maps and cross-sections see Plate III-8-b and III-8-b-1.

(b)(5) Contemporaneous reclamation for embankments, topsoil stockpiles, and etc. will include the following seed amounts and procedures;

Crested wheat grass	6# PLS per A.
Yellow sweet clover	6# PLS per A.

The best results in reseeding that we have attained in this area has been to scarify the ground, broadcast the seed and harrow the seed in lightly, as late as possible in the fall and still have the planting under the winter snow. The proper time for this is the first week in November. Any snow that falls before that time will melt off again before winter. This method has been very successful without the use of mulch, as the seed germinates immediately after the melting of the snow from the moisture of the snow melt. The use of yellow sweet clover in the seed mix adds to the success of the planting as it is very easy to get started under almost any condition, provides a cover to assist the other plants in starting, and adds to the nutrients of the soil. It is often used as a rotation crop by farmers as a soil builder. It is bi-ennial and helps control erosion while the perennials get a full stand and native plants from adjacent areas spread into the reseeded area. Irrigation will not be used due to nature of the terrain as results would be spotty at best. It is not needed if the planting is under the snow as described above. The on ly exception will be in the case of small areas near a building that has water pressure for sprinkling. Contemporaneous reclamation of these small areas will take place at any time of the year as soon as the earthwork is completed. For these plantings a straw mulch will be used and irrigation will be by sprinkling.

Soil samples have been collected from various topsoil sites and tested by agriculture consultants. The results of these analyses and recommended nutrient additives are included under this cover as 'Exibit #1'.

UMC783.14 Geology Description

We have not vet received the contour maps or the results of the test samples for the development of the upper storage pad, so we are requesting an extension of time for that portion only of the modified plan. We agree to not enter or use that portion of the permit area for any purpose, for mining operations or further construction untill that portion of the modification has been completed.

UMC 783.25 Cross- sections, Maps and plans

(k) Please refer to Plate III-8-b-1 and III-9-b-2

Roads. Please refer to 784.24 of this package.

Surface structures will consist of; a shop, parts warehouse, bath house, mine offices, lamp house, truck scales, weighmans office, caretaker dwelling, mine run coal receiver bin, crushing and sizing structure, truck load-out bins, stockpile towers, and conveyors to carry coal to the storage and loadout sites. These structures will have cement footings and will be constructed with cincrete blocks and/or steel. These will each be used for the purpose as designed (shop for repair and maintenance of equipment, bath house for showers and lockers, etc.). They will be maintained by painting and repairing as needed. Moving parts such as conveyors will be maintained by regular greasing and by replaceing worn parts as needed.

Upon completion of mining operations, all structures will be removed, including the cement footings and the land will be returned to the approximate original configuration in preperation for final reclamation.

CO-OP MINING CO.

P.O. Box 15809
Salt Lake City, Utah 84115
Phone (801) 467-4003

NOV. 26, 1982

SCALEHOUSE MODIFICATION

Wendell Owen

Wendell Owen

Docket # 84-040
Cause # ACT/015/025

If during mine operations, an inflow of groundwater is encountered from a point source with a sustained quantity of 1 gpm or greater over a 30-day period, a regular monitoring point of this groundwater will be maintained. Monitoring will be on a monthly basis. Samples will be taken of water quality and quantity with reporting done on a standard sampling chart. This monitoring will be carried out for a base-line period of one year or until the area is rendered inaccessible. In addition, the underground storage water will be monitored, and in the event discharging from the mine becomes necessary; discharged water will be monitored for quality and quantity. On a quarterly basis, a summary report will be submitted to DOGM which includes: a map of the underground working showing monitoring locations, identification of the source, sample qualities and quantities, and a narrative discussing current inflows, discharges, storage and uses of mine groundwater.

COP Development Spring, a small intermittent spring 300 feet northeast of Bear Creek Spring, will be monitored by Co-Op Mining (see plate 7-4).

Refer to 7.2.4 Surface Water Monitoring Plans for specifics on flow calculations and parameters tested for and refer to Figure 7-4 for reporting format.

the mine bathhouse. Co-Op Mining Company possesses water rights for this purpose at the Trail Canyon portal and currently has an application before the State Water Rights Division to change the point of diversion to the Bear Canyon portal. If it becomes necessary to discharge the minewater other than as noted above it will be discharged to the sedimentation ponds. Co-Op Mining will monitor these discharges for quantity and quality.

7.1.3.2 MITIGATION AND CONTROL PLANS

An agreement between Huntington City and Co-Op Mining Company has been established to replace to the City any lost of culinary water from the Bear Canyon Spring, either in quality or quantity, due to mining operations, even though mining is highly unlikely to affect this spring.

Appendix 7-B contains a copy of this agreement between Huntington City and Co-Op Mining Company.

In the event that Co-Op Mining would need to replace water to Huntington City, the Company presently owns 300+ shares in the Huntington-Cleveland Irrigation Company and will purchase additional shares at some future date if necessary. In addition, Co-Op Mining Company carries liability insurance that includes coverage of water wells and springs (see Appendix 7-C).

7.1.3.3 GROUNDWATER MONITORING PLANS

selected springs. Tables 7-4 and 7-5 list the results of those measurements and analysis for the Bear Canyon Spring and for adjacent springs that were analyzed. (See Figure 7-2 for general locations of springs.)

7.1.3 EFFECTS OF MINING OPERATIONS ON GROUNDWATER

Danielson in the U.S.G.S. Open-file Report 81-539 states that:

> "The effects of underground coal mining on the water resources of the study area mainly are dependent on the amount of mine dewatering and the magnitude and a real extent of mine-related land subsidence....Where subsidence has not been extensive and where water-bearing zones that overlie the Star Point-Blackhawk aquifer are perched, it is unlikely that mine dewatering induces greater recharge to the groundwater system. Neither is it likely under these conditions that the flow of springs that issue from the perched zones or the rate of natural downward leakage into the Star Point-Blackhawk aquifer are affected by mine dewatering....It is unlikely that mine dewatering in the study area has had any adverse effect on the chemical quality of the groundwater."

The Bear Canyon Mine is a prime example of a mine with little subsidence and little mine dewatering, and what dewatering there is is from perched water zones. In addition Mr. Kaliser expressed the following:

> "In brief, my conclusion is that it is highly unlikely that the mine plan as presented to me by the Co-Op Company would interfere with the quantity or quality of any of those springs, particularly the one in question, the Bear Canyon Spring."

7.1.3.1 MINE DEWATERING

Water entering the mine will be stored in an underground tank and utilized for dust control on the roads and surface coal facilities and for

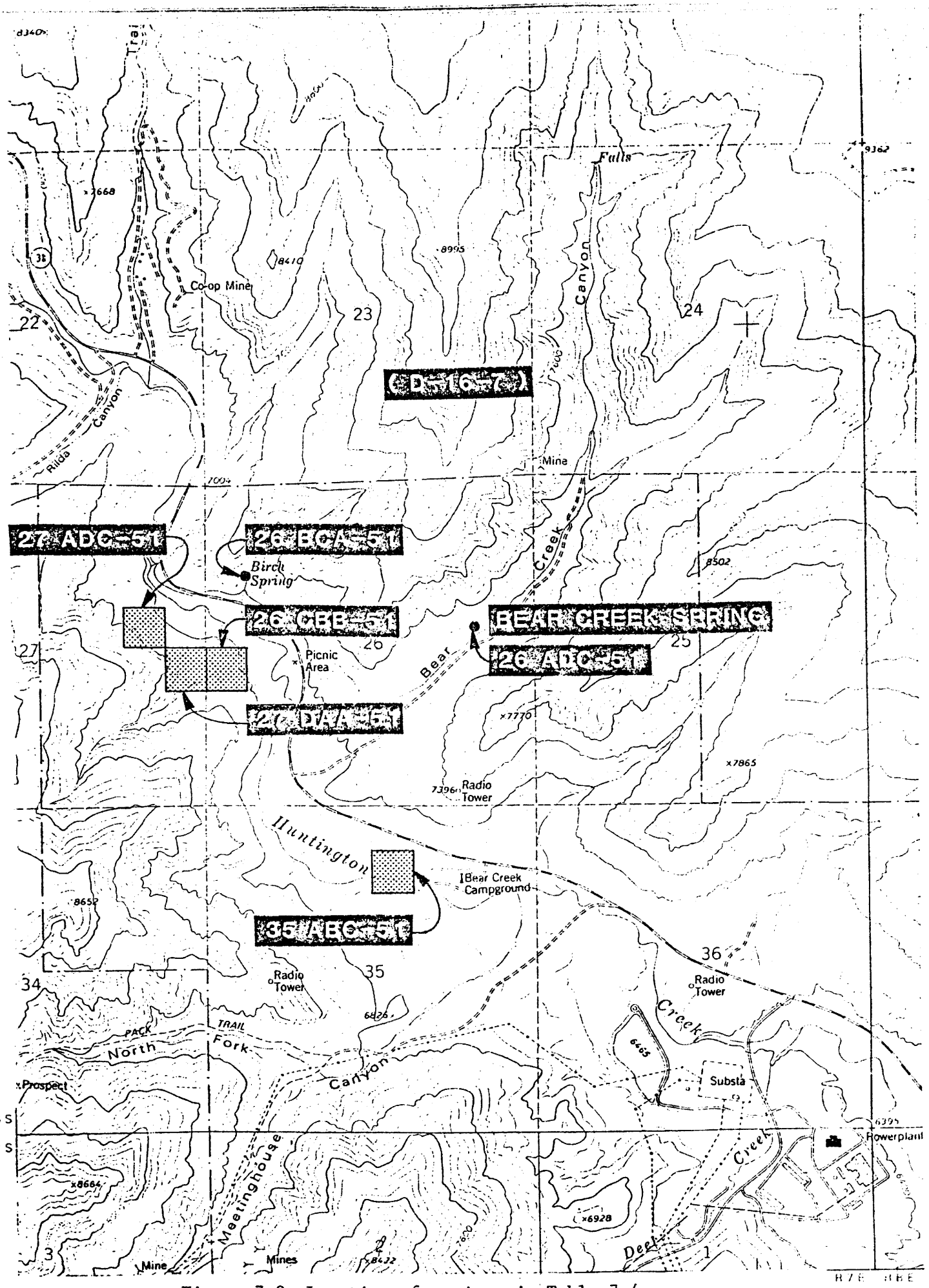


Figure 7-2 Location of springs in Table 7-4

TABLE 7-5
(continued)

Location	(D-16-7) 26adc-S1	(D-16-7) 26bca-S1	(D-16-7) 26cbb-S1	(D-16-7) 35abc-S1
Alkalinity* (as $CaCO_3$)	250	320	350	310
Dissolved* Sulfate (as SO_H)	26	71	140	190
Dissolved* Chloride (as Cl)	4.0	8.1	7.3	15
Dissolved* Fluoride (as F)	.1	.2	.2	.2
Dissolved* Silica (as SiO_2)	6.6	7.6	7.4	10
Dissolved Solids,* Sum of Constituents	303	414	530	591
Dissolved** Boron (as B)	20	80	30	70
Dissolved** Iron (as Fe)	--	0	20	0
Dissolved** Strontium (as Sr)	280	360	430	490

*units of milligrams/liter
**units of micrograms/liter

TABLE 7-5

Chemical Analyses of Water from Selected Springs

Location	(D-16-7) 26adc-S1	(D-16-7) 26bca-S1	(D-16-7) 26cbb-S1	(D-16-7) 35abc-S1
Geologic Unit	211SRPN	211SRPN	211SRPN	111ALVM
Date of Sample	10-3-77	8-9-79	8-22-79	8-9-79
Altitude	7,120	6,860	6,950	6,620
Hardness (as $CaCO_3$)	320	380	440	510
Noncarbonate Hardness (as $CaCO_3$)	64	61	94	200
Discharge (gpm)	75	15	54	9.5
Specific Conductance	550	690	830	900
pH	6.8	7.5	7.2	7.7
Water (°C) Temperature	9.5	11.0	10.0	10.0
Dissolved* Calcium (as Ca)	78	83	82	92
Dissolved* Magnesium (as Mg)	30	42	58	69
Dissolved* Sodium (as Na)	4.1	6.6	21	24
Sodium* Absorption Ratio	.1	.1	.4	.5
Dissolved* Potassium (as K)	1.1	2.3	2.7	3.9
Bicarbonate* (as HCO_3)	310	--	--	--
Carbonate* (as CO_3)	0	--	--	--

111ALVM	79-07-20	6620.00	21	900	7.2	10.5	--
111ALVM	79-08-07	6620.00	35	760	7.3	11.0	--
111ALVM	79-08-22	6620.00	38	1080	--	10.0	--
111ALVM	79-08-31	6620.00	35	--	--	--	--
111ALVM	79-09-17	6620.00	40	1090	--	9.5	--
111ALVM	79-10-16	6620.00	32	850	--	11.0	--

	211SRPN	78-07-06	7120.00	150	--	--	--	--
	211SRPN	78-07-28	7120.00	150	--	--	--	--
	211SRPN	78-08-10	7120.00	160	--	--	--	--
	211SRPN	78-08-30	7120.00	155	--	--	--	--
	211SRPN	78-10-13	7120.00	165	--	--	--	--
	211SRPN	78-10-25	7120.00	160	--	--	--	--
	211SRPN	78-11-01	7120.00	155	--	--	--	--
	211SRPN	78-12-13	7120.00	145	--	--	--	--
	211SRPN	79-03-07	7120.00	135	--	--	--	--
(D-16-7) 26BCA-S1	211SRPN	78-05-25	6860.00	23	--	--	--	--
	211SRPN	78-08-10	6860.00	19	--	--	11.0	--
	211SRPN	78-10-11	6860.00	19	--	--	11.0	--
	211SRPN	78-11-07	6860.00	19	--	--	10.5	--
	211SRPN	78-12-13	6860.00	19	--	--	10.0	--
	211SRPN	79-06-14	6860.00	10	--	--	11.0	--
	211SRPN	79-06-28	6860.00	10	720	8.0	11.0	--
	211SRPN	79-07-20	6860.00	9.3	660	7.0	11.5	--
	211SRPN	79-08-22	6860.00	21	750	--	10.5	--
	211SRPN	79-09-17	6860.00	19	750	--	10.5	--
	211SRPN	79-10-16	6860.00	20	680	--	11.5	--
(D-16-7) 26CBB-S1	211SRPN	78-08-10	6950.00	57	--	--	11.0	--
	211SRPN	78-10-11	6950.00	57	--	--	10.0	--
	211SRPN	78-11-07	6950.00	57	--	--	10.0	--
	211SRPN	78-12-13	6950.00	57	--	--	10.0	--
	211SRPN	79-05-10	6950.00	44	--	--	--	--
	211SRPN	79-06-28	6950.00	30	820	7.6	10.5	--
	211SRPN	79-07-16	6950.00	27	710	7.0	12.5	--
	211SRPN	79-09-18	6950.00	65	760	--	9.5	--
	211SRPN	79-10-18	6950.00	60	750	--	11.0	--

TABLE 7-4
Continued

(D-16-7) 27ADC-S1	211SRPN	78-08-10	7000.00	15	--	--	11.0	--
	211SRPN	78-10-11	7000.00	5.8	--	--	11.0	--
	211SRPN	78-11-07	7000.00	4.9	--	--	10.0	--
	211SRPN	78-12-13	7000.00	5.4	--	--	10.0	--
	211SRPN	79-05-10	7000.00	.0	--	--	--	--
	211SRPN	79-06-28	7000.00	.0	--	--	--	--
	211SRPN	79-08-22	7000.00	2.0	870	--	10.0	--
	211SRPN	79-09-18	7000.00	3.4	780	--	10.0	--
	211SRPN	79-10-18	7000.00	3.1	730	--	11.5	--
(D-16-7) 35ABC-S1	111ALVM	78-10-13	6620.00	22	--	--	--	--
	111ALVM	78-11-08	6620.00	20	--	--	--	--
	111ALVM	78-12-11	6620.00	23	--	--	--	--
	111ALVM	79-05-11	6620.00	26	--	--	--	--
	111ALVM	79-06-28	6620.00	20	960	8.1	10.5	--

TABLE 7-4

Field determinations of discharge, specific conductance, pH, water temperature and alkalinity at selected springs -- Continued

LOCATION	GEO-LOGIC UNIT	DATE OF SAMPLE	ALTI-TUDE	DIS-CHARGE (GAL/MIN)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	ALKA-LINITY FIELD (MG/L) AS $CACO_3$
(D-16-7)26ADC-S1	211SRPN	78-04-27	7120.00	110	--	--	--	--
	211SRPN	78-05-26	7120.00	110	--	--	--	--
	211SRPN	78-06-09	7120.00	120	--	--	--	--
	211SRPN	78-06-23	7120.00	130	--	--	--	--
	211SRPN	78-07-06	7120.00	150	--	--	--	--
	211SRPN	78-07-28	7120.00	150	--	--	--	--
	211SRPN	78-08-10	7120.00	160	--	--	--	--
	211SRPN	78-08-30	7120.00	155	--	--	--	--
	211SRPN	78-10-13	7120.00	165	--	--	--	--
	211SRPN	78-10-25	7120.00	160	--	--	--	--
	211SRPN	78-11-01	7120.00	155	--	--	--	--
	211SRPN	78-12-13	7120.00	145	--	--	--	--
	211SRPN	79-03-07	7120.00	135	--	--	--	--
(D-16-7)26BCA-S1	211SRPN	78-05-25	6860.00	23	--	--	--	--
	211SRPN	78-08-10	6860.00	19	--	--	11.0	--
	211SRPN	78-10-11	6860.00	19	--	--	11.0	--
	211SRPN	78-11-07	6860.00	19	--	--	10.5	--
	211SRPN	78-12-13	6860.00	19	--	--	10.0	--
	211SRPN	79-06-14	6860.00	10	--	--	11.0	--
	211SRPN	79-06-28	6860.00	10	720	8.0	11.0	--
	211SRPN	79-07-20	6860.00	9.3	660	7.0	11.5	--
	211SRPN	79-08-22	6860.00	21	750	--	10.5	--
	211SRPN	79-09-17	6860.00	19	750	--	10.5	--
	211SRPN	79-10-16	6860.00	20	680	--	11.5	--
(D-16-7)26CBB-S1	211SRPN	78-08-10	6950.00	57	--	--	11.0	--
	211SRPN	78-10-11	6950.00	57	--	--	10.0	--
	211SRPN	78-11-07	6950.00	57	--	--	10.0	--
	211SRPN	78-12-13	6950.00	57	--	--	10.0	--
	211SRPN	79-05-10	6950.00	44	--	--	--	--
	211SRPN	79-06-28	6950.00	30	820	7.6	10.5	--
	211SRPN	79-07-16	6950.00	27	710	7.0	12.5	--
	211SRPN	79-09-18	6950.00	65	760	--	9.5	--
	211SRPN	79-10-18	6950.00	60	750	--	11.0	--

TABLE 7-3

COMPARISON OF BEAR CANYON SPRING WATER QUALITY DATA W/STANDARDS
OCTOBER 3, 1977

	Spring	Federal Drinking Water Criteria	Utah Division of Health Water Standards	
			Domestic Water Class 1A	Aquatic Life Class 3A
pH (units)	6.8	6.5 - 8.5	6.5 - 9.0	6.5 - 9.0
Temp (C°)	9.5	----	----	less than 20
Spec Cond (umhos)	550	----	----	----
TDS (mg/l)	303	500	Case by case basis	
Iron (mg/l) (total-dissolved dissolved)	----	0.3 total	----	0.05
Sulfate (mg/l)	26	250	----	----
Chloride (mg/l)	4	250	----	----
Calcium (mg/l)	78	200	----	0.002
Magnesium (mg/l)	30	150	----	----
Sodium (mg/l)	4.1	200	----	----
Bicarbonate (mg/l)	310	500	----	----
Carbonate (mg/l)	0	----	----	----
Fluoride (mg/l)	.1	0.7 - 1.2	1.4 - 2.4	----
Silica (mg/l)	6.6	----	----	----
Total ALK as $CaCo_3$	250	----	----	----
Boron (mg/l)	.02	----	----	----
Potassium (mg/l)	1.1	----	----	----
Strontium (mg/l)	.28	----	----	----

TABLE 7-4

Field determinations of discharge, specific conductance, pH, water temperature and alkalinity at selected springs -- Continued

LOCATION	GEO-LOGIC UNIT	DATE OF SAMPLE	ALTI-TUDE	DIS-CHARGE (GAL/MIN)	SPE-CIFIC CON-DUCT-ANCE (UMHOS)	PH (UNITS)	TEMPER-ATURE (DEG C)	ALKA-LINITY FIELD (MG/L) AS $CACO_3$
(D-16-7)26ADC-S1	211SRPN	78-04-27	7120.00	110	--	--	--	--
	211SRPN	78-05-26	7120.00	110	--	--	--	--
	211SRPN	78-06-09	7120.00	120	--	--	--	--
	211SRPN	78-06-23	7120.00	130	--	--	--	--

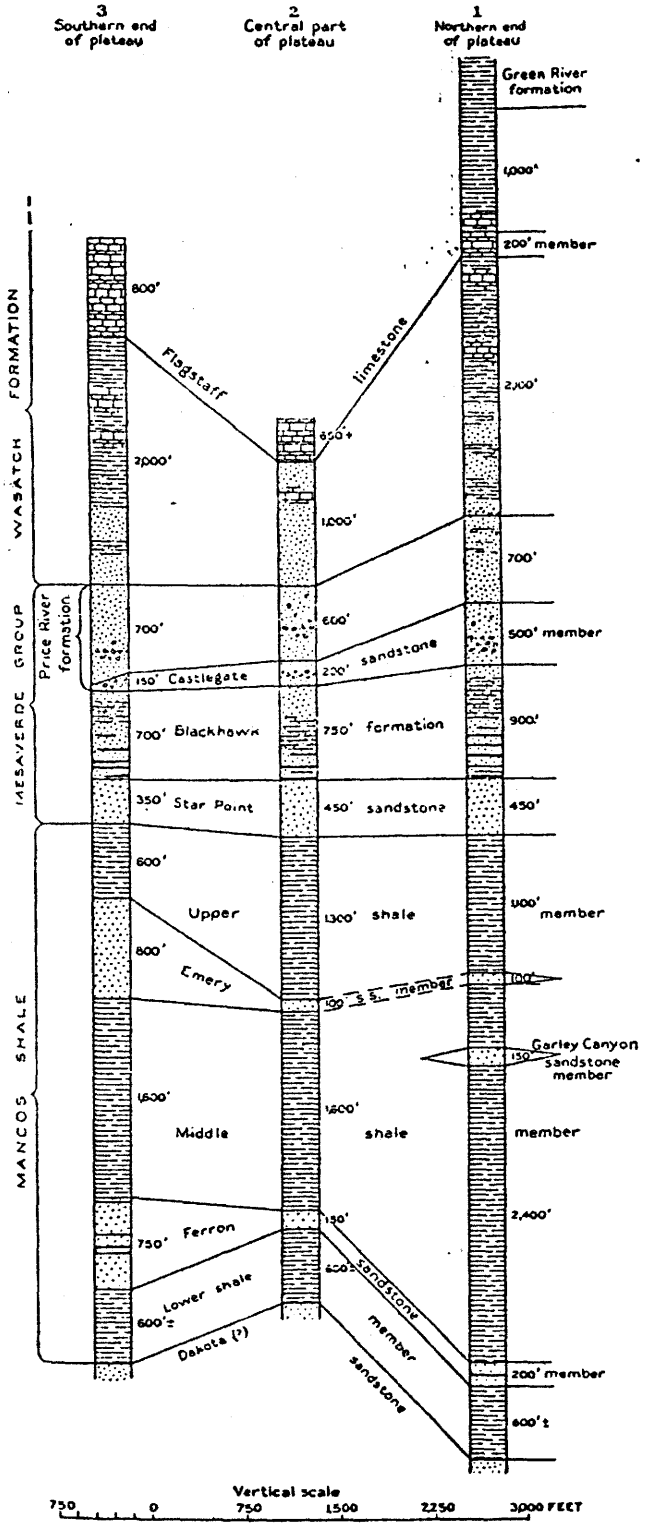


FIGURE 7-1 - COLUMNAR SECTIONS OF ROCKS IN THE WASATCH PLATEAU COAL FIELDS